

Manufacturers' Prices and Pharmacists' Charges for Prescription Drugs Used By The Elderly

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I. EXECUTIVE SUMMARY

The elderly population is growing in total number and as a percent of the total United States population. Therefore, the utilization and cost of health care in this population is of increasing interest. Passage of legislation in 1988, establishing coverage of catastrophic outpatient prescription expenses under Medicare, caused special interest in prescription usage by the elderly. Although the legislation was repealed, it focused attention on the necessity for pharmaceutical price trend data in forecasting and managing drug benefit program expenditures.

The analysis presented in this report was undertaken to identify those drug entities that account for a significant proportion (80 percent) of the elderly's retail expenditures on prescription drugs. The report also analyzes changes in manufacturers' prices and pharmacists' charges for those drugs between 1981 and 1988.

The National Disease & Therapeutic Index (NDTI) and the National Prescription Audit (NPA) databases maintained by IMS America, Ltd. were used to estimate expenditures on prescription drugs by the individuals age 65 and over. The analysis of changes in pharmaceutical prices focused on the drug entities that accounted for 80 percent of retail expenditures by elderly consumers. The IMS U.S. Drugstores Audit (USD) was used to measure manufacturer price changes and the NPA was used to provide measures of retail prescription price changes.

Several fixed weight Laspeyres price indices were developed to allow analysis of trends in drug prices apart from changes in the mix of drugs dispensed. The year 1984 was chosen as the base year for the indices. Only drugs included in the list of drug entities accounting for 80 percent of retail prescription expenditures by the elderly were included in the indices.

Each drug product's weight in an index was based on the quantity of the product purchased during the 1984 base year.

Analysis of the simple average annual change in the cost of the drug entities including changes in the mix of drug products sold was also conducted. This analysis was important in reflecting the impact of products introduced after 1984 upon the cost of multiple source drugs.

Findings based on the analysis presented in this report include:

- The elderly population was estimated to account for approximately 34.3 percent of 1988 retail expenditures on prescription drugs.
- A total of 104 drug entities (11.4 percent of all drug entities) accounted for 80 percent of expenditures by the elderly.
- Manufacturers' prices increased at an average annual rate of 9.1 percent and retail prices increased at an average annual rate of 7.2 percent when based on the mix of products marketed in 1984.
- Manufacturers' prices increased an average annual rate of 6.8 percent and retail prices increased at an average annual rate of 6.6 percent when changes in the mix of products sold were considered.
- Manufacturers' prices for originator multiple source drugs experienced greater annual change in prices (10.8 percent) than did non-originator multiple source drugs (2.7 percent) or single source drugs (8.6 percent) based on the drug price indices developed.
- Non-originator multiple source products' dollar share of the multiple source market increased from 14.2 percent in 1981 to 31.0 percent in 1988. Non-originator multiple source products' dollar share of the total market increased slightly from 11.3 percent in 1981 to 15.3 percent in 1988.
- Between 1981 and 1988, in nominal dollar terms, the average prescription price increased from \$10.73 to \$20.78, cost of the ingredients to pharmacies increased from \$6.94 to \$15.29, and pharmacies' margins increased from \$3.79 to \$5.48.
- In 1981 constant dollars, pharmacies' dollar margins increased \$0.33 in real dollar terms while the cost of the product dispensed increased \$4.56 in real dollar terms.
- Between 1981 and 1988 retail pharmacies' net profits decreased because pharmacies' charges or margin did not increase enough to offset increases in drug product cost and operating expenses.
- Pharmacies' average percent margins on prescriptions declined from 35.3 percent in 1981 to 26.4 percent in 1988.

- Cost management pressures of the 1980s led to the emergence of new health care delivery structures influencing changes that occurred in the traditional channels of prescription pharmaceutical distribution.
- The elderly population is particularly affected by the continuing rapid rise in drug prices. While it may be difficult to determine a direct relation between rising costs and the proper use of prescriptions, it can be assumed that rising costs could exacerbate known problems with access to and compliance with drug therapy by the elderly.

II. INTRODUCTION

The elderly population, those age 65 and over, is growing rapidly in total number and as a percent of the total United States population. Therefore, the utilization and cost of health care in this population has become of increasing interest. Passage of legislation, in 1988, establishing coverage of catastrophic outpatient prescription expenses under Medicare caused special interest in prescription usage by the elderly. Although the legislation was repealed, among many issues, it focused attention on the necessity for detailed pharmaceutical price trend data in forecasting and managing drug benefit program expenditures.

In a 1989 Report to Congress on Manufacturers' Prices and Pharmacists' Charges, the Consumer Price Index (CPI) and the Producer Price Index (PPI) were used to analyze changes in manufacturers' prices and pharmacists' charges for pharmaceuticals (U.S. DHHS, May 1989). However, the analysis was by definition restricted to only those drugs included in the CPI and PPI. As such, the data did not allow analysis of the price trends of those drugs which account for the majority of the elderly's retail expenditures on prescription drugs.

The current analysis was undertaken to allow identification of those drug entities that account for a significant proportion of the elderly's retail expenditures on prescription drugs. The report also analyzes changes in manufacturers' prices and pharmacists' charges for those drugs between 1981 and 1988.

Finally, there is provided an analysis of the dynamic state of change in the channels of distribution for prescription pharmaceuticals.

III. PRESCRIPTION DRUG EXPENDITURES BY THE ELDERLY

A. Data and Methodology

One objective in preparing this report was to provide an estimate of expenditures by the elderly on frequently prescribed drugs. The operational goal was to provide a list of drugs accounting for 80 percent of all non-hospital drug expenditures by individuals age 65 and over during 1988.

The approach used to estimate expenditures on prescription drugs by persons age 65 and over relied on data from the National Disease & Therapeutic Index (NDTI) and the National Prescription Audit (NPA) databases published by IMS America, Inc. The NDTI database is a continuing compilation of information on treatment of diseases for patients encountered by physicians in office-based practice. Types of drug therapy are recorded in the NDTI in association with a variety of characteristics including patient age.

The NPA database provides estimates of prescriptions dispensed in retail pharmacies including total prescription quantities and prices paid at retail for the prescriptions. The NPA data provide estimates of total retail drug expenditures on various drugs by the entire U.S. population. However, the NPA data do not record prescription activity by consumer age. Therefore, the NDTI data on drug mentions was used to estimate the proportion of retail prescription expenditures on each drug product that was accounted for by the elderly.

The age variable in the NDTI database was used to calculate the percentage of total drug mentions for elderly patients (age 65 and over) for each drug entity. This percentage was used with the NPA expenditures for each product to estimate the retail prescription expenditures accounted for by patients age 65 and over. The total retail expenditures on drugs by elderly

consumers was estimated by summing the expenditures by elderly patients for each product. The drugs were then sorted by expenditures in the elderly population and cumulative totals were calculated to find which drugs accounted for 80 percent of 1988 total drug expenditures in the elderly population.

B. Findings on Expenditures by the Elderly

The drug entities accounting for 80 percent of retail prescription expenditures among the elderly population are ranked by retail expenditures per drug and listed in Table 1. The estimate of total 1988 retail prescription drug expenditures based on the NPA data was \$26.5 billion. Expenditures by the elderly population was estimated at \$9.1 billion or 34.3 percent of total retail expenditures on prescription drugs. A total of only 104 drug entities accounted for 80 percent of retail drug expenditures in the elderly population. The 104 entities represent 11.4 percent of 913 total drug entities in the database.

Each of the drugs was categorized as a single source or multiple source drug and each group was sorted by retail expenditures in the elderly population. Table 2 shows the single source drugs and Table 3 shows the multiple source drugs that were included in the list of drugs accounting for 80 percent of expenditures in the elderly population. There were 41 single source drug entities and 63 drug entities were available from multiple sources. The 63 multiple source drug entities accounted for 44.2 percent of the elderly's total retail prescription drug expenditures and the single source drugs accounted for 35.9 percent of such expenditures. The remaining 809 drug entities that accounted for 19.9 percent of the elderly's total retail prescription drug expenditures were not classified.

Drugs accounting for the highest proportion of retail drug expenditures by the elderly were not necessarily those used most heavily by elderly individuals. For example, ranitidine was ranked number one based on proportion of expenditures by the elderly. However, when the drugs were ranked by percent of total dosage units used by the elderly, ranitidine was ranked 70 out of the 104 drugs accounting for 80 percent of expenditures by the elderly (Table 4). Patients age 65 and over received 35.6 percent of all the units of ranitidine dispensed. This is in contrast to 89.1 percent of all ergoloid dosage units that were dispensed to elderly patients. Similarly, chlorthalidone was ranked 104 based on expenditures in the elderly but was ranked 33 in terms of percentage of units used by the elderly.

These findings can easily be explained by differences in popularity of individual drugs as reflected in the number of total units used in the entire population. Wide differences in cost per dosage unit across individual drugs also explains differences in percentage of units used and percentage of elderly drug expenditures accounted for by various drugs.

IV. PHARMACEUTICAL PRICE CHANGES: 1981 TO 1988

B. Data and Methodology

The analysis of changes in pharmaceutical prices focused on the drug entities that accounted for 80 percent of retail expenditures by consumers age 65 or over. The analysis examined pricing patterns at three levels: manufacturers' prices per unit by drug, retail prescription price per unit by drug, and retail pharmacists' charges per unit by drug. The retail pharmacists' charge per unit was defined as the difference (margin) between retail prescription price per unit and manufacturers' price per unit. Two IMS America, Inc. databases, the U.S. Drugstores Audit (USD) and the National

Prescription Audit (NPA) were used to provide measures of drug price changes during the period from 1981 through 1988.

The U.S. Drugstore Audit (USD) is a continuing collection and monthly report of data on prescription and OTC pharmaceuticals purchased by retail outlets. The database provides estimates of purchases of prescription products by retail pharmacies in terms of unit volume and dollar costs incurred based on invoice audits. The USD data were used to provide measures of manufacturers' prices for each drug product.

Monthly USD unit volume figures were summed to calculate the total number of units of each drug purchased by retail pharmacies during January through June and July through December of each year. Likewise, monthly purchase costs were summed to calculate total costs of the products purchased during each of the six month periods from 1981 through 1988. The total amount paid was divided by the total number of units purchased during each six month period to calculate average manufacturers' price per unit by drug during the period.

The National Prescription Audit (NPA) was used to estimate retail prescription prices for each drug. The NPA database provides monthly estimates of prescriptions dispensed in retail pharmacies including the number of units per prescription and the retail price paid by consumers for each prescription. Monthly NPA figures were summed to calculate the total number of units dispensed of each drug during the January through June and July through December periods of each year. The monthly estimates of expenditures made by consumers to purchase the units dispensed in retail pharmacies were also summed for each six month period. Total retail prescription revenue (i.e., total expenditures by consumers) for each drug during each period was divided by total units dispensed of each drug during the same period to yield the average retail prescription price per unit for each drug.

Several price indices were developed to allow analysis of trends in drug prices. Since the goal was to assess the magnitude of price changes over time apart from changes in the mix of drugs dispensed, fixed weight Laspeyres price indices were developed. Laspeyres indices are fixed weight price indices in which quantities of items purchased in a chosen base year are employed as weights. The indices are based on comparing the cost of purchasing fixed quantities, those identified in the base year, of a fixed set or "market basket" of items at prices in different time periods with the cost of purchasing that same "market basket" in the base year. The Consumer Price Index (CPI) and Producer Price Index (PPI) are also Laspeyres indices so choice of the Laspeyres formula for calculation of indices facilitated comparison of the current results with an earlier analysis based on comparison of the CPI and PPI for drugs (U.S. Department of Labor, 1984).

Choice of the base year for product quantities to be used as weights in the index was influenced by several factors. Use of fixed weight price indices meant that products not marketed in the base year would be excluded from the "market basket" used in developing the index and hence the index. The time periods for which data were available was from 1981 to 1988 so the alternative choices for base years were any of the years from 1981 through 1988 inclusive. If 1981 had been chosen as the base year, any products marketed after that time would be excluded from the index. On the other hand, if 1988 was chosen as the base year, many recently marketed products with price data for only one or two periods would have been included in the index. After examining the number of products that would be excluded if each alternative base year was selected, 1984 was chosen to balance exclusion of

products not marketed before the base year and inclusion of products for which very few prior years' data points were available.

1. Price Indices

Only drugs included in the list of drug entities accounting for 80 percent of retail prescription expenditures by consumers age 65 or over and those drugs for which 1984 expenditure data existed were included in the indices. Manufacturer and retail level product costs were estimated at semi-annual intervals from January 1981 through December 1988. Products were required to have valid data for at least 11 of 16 possible observations on manufacturer prices and 11 of 16 possible observation on retail prices. After applying the above criteria, 85 of the 104 drug entities accounting for 80 percent of retail expenditures by the elderly were included in the price indices. Single source drug entities accounted for 24 of the 85 drugs included and the other 61 drug entities were classified as multiple source drugs. A total of 1,122 drug products were included in the index when drug entity, dosage form, dosage strength, and manufacturer were considered. The 85 drug entities represented in the index accounted for 66.7 percent of all drug expenditures by the elderly. Each product's contribution or weight in an index was based on the total quantity of the item purchased at the retail level from July through December 1984.

A composite retail drug price index was developed to represent the changes in prices of all the relevant drugs. To calculate the value of the index in a given time period, the NPA based unit retail price for each drug product during that time period was multiplied by the NPA estimate of the quantity of the product sold at retail in the 1984 base year. After multiplying the period's prices by the base year quantities for each drug

product, the results were summed to yield the cost of purchasing the "market basket" of drugs at that period's prices. The estimate of the total cost of the "market basket" of drugs in the given time period was divided by the total cost of the 1984 base year quantities of each product at 1984 prices to yield the index value for the chosen time period. After calculation of index values for each period from 1981 through 1988 the index values were multiplied by a constant which adjusted the January through June 1981 period to a value of 100. This adjustment was for convenience in comparing the relative magnitude of price changes in various price indices and for ease in presenting graphical trends in the value of the indices over time.

The composite manufacturers' drug price index was calculated in a similar manner. However, to maximize comparability of the manufacturer and retail level indices, the same weights, i.e. the quantities, used in the retail price index were multiplied by manufacturers' unit prices for each item as calculated from USD data. As with the retail index, after calculating the individual index values, each one was multiplied by a constant which converted the composite manufacturers' price index to a value of 100 for the January through June period of 1981.

Separate retail and manufacturer level price indices were calculated for single source and multiple source drugs. To encourage innovation, the Federal government grants exclusive marketing rights (i.e., patents) for a limited period of time to companies successful in discovering and obtaining New Drug Application approval for new chemical entities. During this period of exclusivity, when the drug is available only from one company, the drug is called a single source drug. After the patent on a drug entity has expired, other manufacturers may apply for and receive FDA approval to market the drug. Once these manufacturers bring additional products to the market, the drug is

generally referred to as a multiple source drug. For the purposes of this analysis a multiple source drug was defined as any drug for which there were two or more drug products rated as therapeutically equivalent according to the Food and Drug Administration's "Approved Drug Products with Therapeutic Equivalence Evaluations."

The product marketed by the company that first marketed a drug entity is usually referred to as the "originator" product to distinguish it from all other products for the drug entity. All products other than those marketed by the first company to market the drug entity are generally referred to as "non-originator" products. In some instances companies may enter agreements to jointly bring a new drug entity to market with their individual products. If two products marketed under such an arrangement were the first marketed for a given drug, then both were considered originators in this analysis.

Because of the hypothesized impact on prices of differences in the level of competition for single source and multiple source drugs, each category of drugs was analyzed separately to allow detection of differences in price trends for the two categories.

When a product first becomes available from multiple sources there is a period when new products and competition enter the market. After several years as a multiple source entity, the number of new companies entering the market tends to level off. In order to analyze price trends for products that were recently available from multiple sources with those that had been multiple source for long periods, price changes were analyzed separately for pre-1981 and post-1981 multiple source drugs. The first company to market a drug entity is likely to gain some competitive advantage over subsequently marketed products. Price changes for originator and non-originator products

for multiple source drugs were also analyzed to detect whether those differences affected changes in prices.

For single source drugs the items included in the index were limited to those drug products that had been classified as single source drugs. Therefore, the single source drug price index was based on the ratio of the total cost of purchasing the base year quantities of the single source products at a given period's prices as compared to the total cost of purchasing the same "market basket" quantities at 1984 base year prices. Similar approaches were used to calculate retail and manufacturer level drug price indices for multiple source drugs. In each case, the index values were multiplied by an appropriate constant to convert each index to a value of 100 for the January through June period of 1981.

Multiple source drugs were further categorized as pre-1981 or post-1981 multiple source drugs based on when they first became available from multiple sources. Multiple source drug products were also classified as originator or non-originator products. Individual retail and manufacturer level Laspeyres price indices were developed and trends in those indices were analyzed for each of the categories of multiple source drugs.

2. Simple Average Change in Prices

Analysis of the simple average change in the cost of all 104 drug entities including changes in the mix of drug products sold was also conducted. This analysis was important in reflecting the impact of products introduced after 1984 upon the cost of multiple source drugs. As noted earlier, the use of fixed weight price indices meant that products not marketed in the base year were excluded from the index. The 1984 base year was chosen to balance exclusion of products not marketed before the base years

and inclusion of products for which very few data points were available. However, the index still would not reflect the impact of the introduction of new drug products after the base period, especially among multiple source drug entities. An alternative analysis of simple average change in unit cost of the drug entities was also performed to reflect changes in mix of products available and products' market share.

The unit price for each dosage form and strength for each drug entity was calculated by summing the total dollar sales of all manufacturers' products for that dosage form and strength and dividing by the sum of the units shipped of the same product. The percentage change in unit cost for each dosage form and strength within each drug entity was totaled and divided by the number of dosage forms and strengths to yield the simple average percentage change in the unit cost for the drug entity.

B. All Drugs

Composite Laspeyres indices of manufacturer and retail product prices with constant weights for each product were developed based on the units of each product dispensed in 1984 by retail pharmacies. The constant weights allowed examination of price trends over time without the influence of changes in product mix. Each index was adjusted to a value of 100 for the January through June 1981 period so the relative magnitude of cumulative changes at the manufacturer and retail levels could be compared over time. The annual percent change in manufacturer and retail level weighted price indices at six month intervals from 1981 to 1988 are shown in Figure 1. Figure 2 shows the trends in the manufacturer and retail price indices over the same time period.

The manufacturer drug price index for all drugs increased at an average annual rate of 9.1 percent from 1981 through 1988 (Table 5) while the retail

prescription price index increased at an average annual rate of 7.2 percent (Table 6). The manufacturer price index for all drugs experienced a total increase of 83.5 percent while the retail price index increased 62.6 percent between 1981 and 1988 (Tables 5 and 6). In other words, the percent increase in the retail prescription price index for all drugs was less than the percent increase in the manufacturers' price index during the same time period.

In addition to changes in the price indices, simple average change in the unit cost of the drugs was computed. The simple average change reflects the impact of changes in product mix and market shares not reflected in the price indices. The simple average annual change in manufacturers' prices for all the drug entities was 6.8 percent (Table 7) as compared to the 9.1 percent average annual change in the manufacturer drug price index. The simple average annual change in retail prices was 6.6 percent (Table 8) as compared to the 7.2 percent annual percent change in the retail price index.

C. Single Source Drugs

Drug products were categorized as single source or multiple source drugs to allow analysis of trends in price changes for each drug category. Indices of manufacturer and retail prices for single source drugs were computed to analyze the trends in prices without the influence of changes in product mix. The Laspeyres indices were based on the number of units of each product dispensed by retail pharmacies in 1984. The indices were adjusted to a beginning value of 100 for the January through June period in 1981 so that the relative magnitude of changes at the retail and manufacturer's level could easily be compared over time.

Figure 3 shows the annual percent change in the manufacturer and retail level indices at six month interval during the 1981 to 1988 time period.

Figure 4 shows the trend in the single source drug price indices from 1981 through 1988. The manufacturer price index for single source drugs increased at an average annual rate of 8.6 percent between 1981 and 1988 as contrasted with a 7.4 percent average annual increase in the retail price index for single source drugs. The July/December 1988 manufacturer price index for single source drugs was 78.1 percent greater than its July/December 1981 value. The retail price index increased 64.4 percent during the same time period (Tables 5 and 6).

The simple average annual change in manufacturers' prices for the single source drugs during the 1981 to 1988 period was 9.2 percent as compared to the 8.6 percent average annual increase in the manufacturer price index for single source drugs. The simple average annual increase in retail prices for single source drugs was 7.2 percent while the retail index increased at an average annual rate of 7.4 percent (Tables 7 and 8).

D. Multiple Source Drugs

Changes in the Laspeyres indices for all multiple source drugs are shown in Figure 5. Trends in the manufacturer and retail drug price indices for all multiple source drugs are shown in Figure 6. The manufacturer price index for multiple source drugs increased 85.8 percent between 1981 and 1988 (Table 5). The retail price index increased 61.9 percent (Table 6) in that same period. The average annual increase in manufacturer and retail price indices for multiple source drugs was 9.3 percent and 7.1 percent respectively.

When the simple average change in prices was analyzed to reflect changes in product mix and market share, the simple average annual change in manufacturers' prices for multiple source drugs was only 6.5 percent as contrasted with the 9.3 percent change in the corresponding price index. The

simple average annual change in retail prices for multiple source drugs between 1981 and 1988 was 6.5 percent as compared to an average annual change of 7.1 percent in the retail price index for multiple source drugs (Tables 7 and 8).

1. Originators and non-originators

Multiple source drug products also were classified as originator and non-originator products so price trends for each category of products could be analyzed. Between 1981 and 1988 the retail and manufacturer price indices for originator multiple source drugs increased much more than the corresponding indices for non-originator multiple source drugs (Figure 7). The average annual percent change in the retail price index for originator drugs was 8.4 percent between 1981 and 1988. Non-originator drugs had an average annual increase in the retail index of 2.7 percent during the same period.

The total increase in the retail price index for multiple source originator drugs between 1981 and 1988 was 76.3 percent as compared to a 20.3 percent increase in the retail price index for non-originator multiple source drugs during the same period (Table 6). The total change in the manufacturer price index for originator multiple source drugs was 105.0 percent as compared to a 20.0 percent increase in the manufacturer price index for non-originator multiple source drugs between 1981 and 1988 (Table 5).

The manufacturer price index had a greater cumulative increase than the retail prescription price index for originator drugs. The manufacturer price index for originator multiple source drugs increased 105.0 percent between 1981 and 1988 in comparison to the 76.3 percent increase in the corresponding retail price index (Figure 7). For non-originator multiple source drugs,

there was a 20.0 percent increase in the manufacturer price index and a 20.3 percent increase in the retail prescription price index between 1981 and 1988.

The simple average annual increase in manufacturers' prices for originator multiple source drugs was 11.2 percent, while the simple average annual increase in manufacturers' prices for non-originator multiple source drugs was only 2.9 percent. Retail prices for the originator products increased at an average annual rate of 9.3 percent based on simple average annual change in price while retail prices for non-originator products increased at a simple average annual rate of 5.0 percent (Tables 7 and 8).

A total of 32 multiple source drugs had data for originator and non-originator products included in the Laspeyres indices. The average annual change in prices for originator products was greater than that of non-originator products for 27 of 32 drugs based on both retail and manufacturer prices. Therefore, the tendency for originator multiple source products to have higher increases in prices than non-originator products appeared to be a general one although, there were some exceptions (Appendix D).

2. Pre-1981 and post-1981 multiple source drugs

Trends in the Laspeyres price indices for pre-1981 and post-1981 multiple source drugs are shown in Figure 8. The increase in the retail price index between 1981 and 1988 for drugs that were available from multiple sources prior to 1981 was 55.3 percent as contrasted with a 76.6 percent increase in the index for drugs that became available from multiple sources after 1981 (Table 6). The average annual increase in the retail price index was 6.5 percent for pre-1981 drugs and 8.5 percent for drugs that became available from multiple sources after 1981. The manufacturer price index again outstripped the retail index by showing a 1981 to 1988 change of 77.2 percent for

pre-1981 multiple source drugs and 103.0 percent for post-1981 multiple source drugs.

The simple average annual change in manufacturers' prices for pre-1981 multiple source drugs was 6.1 percent and 8.9 percent for post-1981 multiple source drugs. The average annual change in retail prices for the pre-1981 multiple source drugs was 6.2 percent and 9.1 percent for post-1981 drugs.

3. Pre-1981 and post-1981 originators and non-originators

Trends in weighted manufacturer and retail price indices for pre-1981 and post-1981 multiple source drugs when separated into originators and non-originators are shown in Figures 9 and 10. When the originator and non-originator drugs were compared the relationships were similar to those discovered when all multiple source drugs were classified as originator or non-originator without regard to when they became available from multiple sources. In other words, the increase in price indices of originator drugs was greater than the increase in price indices of non-originator drugs. Also, manufacturer price indices increased greater than did retail prescription price indices during this time period.

The simple annual percentage change in manufacturers' prices for pre-1981 and post-1981 multiple source drugs are shown in Table 7. The corresponding retail price changes are shown in Table 8. The simple average annual change in manufacturers' prices for pre-1981 originator products (10.8 percent) and post-1981 originator products (12.3 percent) were greater than the corresponding retail price changes of 8.8 percent and 10.7 percent respectively.

When manufacturer and retail prices for all non-originator multiple source drugs were compared, the simple average annual change in manufacturers'

prices was less than the simple average annual change in retail prices for non-originator drugs. The pre-1981 non-originator multiple source drugs had a simple average annual change in manufacturers' prices of 3.8 percent as compared to a simple average annual change of 5.3 percent in retail prices. Manufacturers' prices for the post-1981 non-originator drugs experienced an average annual percent change in price of -2.8 while the simple average annual change in retail prices for the same drugs was 2.9 percent.

4. Non-originators' market share

The share of the drug market accounted for by non-originator drug products was analyzed in terms of total units sold at the retail level and in terms of total dollar sales at the retail level. Market shares were analyzed based on both the market volume of multiple source drugs and the total market volume including multiple source and single source drugs.

In calculating non-originator products' dollar share of the multiple source drug market, retail dollar sales of all non-originator products as reported in the National Prescription Audit were summed and divided by the sum of retail dollar sales of originator and non-originators products for the multiple source drug entities. Non-originator products' unit share of the multiple source drug market was calculated by summing total extended units dispensed at retail of all non-originator products and dividing by the sum of total extended units of originator and non-originator products for the multiple source drug entities.

Non-originator drug products' share of the combined market for the single source and multiple source drugs was calculated using a method similar to that described above. The numerator used in each formula was the same as described above. However, the denominator used was total dollar sales or total extended

units dispensed of all products regardless of whether they were single source or multiple source drugs (Appendix F).

Non-originator products accounted for 44.1 percent of multiple source drug extended units dispensed in 1988. This represented a twenty-seven point increase from the 17.1 percent non-originator unit share of the multiple source market in 1981 (Figure 11). Non-originator products accounted for 14.2 percent of the dollar sales of the multiple source drugs in 1981. In 1988 non-originator products accounted for 31.0 percent of the dollar sales of the multiple source drugs.

When the total market including the single source and multiple source drugs was examined, non-originator products' share of the total number of dosage units dispensed in 1981 was 15.1 percent. By 1988 it increased to 30.5 percent of the total units dispensed. In contrast, non-originator products accounted for only 15.3 percent of total retail dollar sales of single source and multiple source drugs in 1988. That represented an increase from non-originator products' 11.3 percent share of total dollar sales in 1981 (Figure 12). This relationship may be explained by the fact that although more units of non-originator products were being used, the unit price of those products was usually lower than the price of the originator products. The analysis of price changes also showed that the prices of originators' products increased substantially more than the prices of the non-originators' products over the same time period.

V. PHARMACY MARGINS

A. Data and Methodology

To evaluate the relative contribution of pharmacists' charges to changes in retail prescription prices, the difference or "margin" between what

pharmacists paid for pharmaceuticals and the retail prices paid by consumers was analyzed. This margin does not represent pharmacies' profit. It represents the fraction of sales revenue left to pay operating costs such as rent, utilities, and employees' wages after product costs have been subtracted. Such a measure allows the analysis to focus purely on the differential between what pharmacies must pay for drug products and the total charge to their retail customers.

Two approaches were taken in the analysis. The first approach focused on analysis of the average dollar margin received by pharmacies on each prescription dispensed. The second approach was based on analysis of pharmacies' average dollar margin on each unit of drug product sold. The definition of unit used was the IMS defined "extended unit" which is generally equivalent to one capsule or tablet for solid dosage forms, or one milliliter for liquid drug products.

The NPA data provided estimates of unit prices at the retail pharmacy level and the USD data provided estimates of unit prices at the manufacturer's level. However, product unit sales at the retail level would be expected to lag shipments at the manufacturer level. Therefore, a separate estimate of pharmacies' product acquisition costs, or manufacturers' charges, for the number of units dispensed at the retail level during each period was necessary.

The estimate of manufacturers' unit price for each drug during each period was multiplied by the total number of units of the drug dispensed at the retail level during the corresponding period. This provided an estimate of the total manufacturers' price for the number of units dispensed at retail. In other words, this represented pharmacies' product acquisition costs for the number of units dispensed in a given period. This aggregate product

acquisition cost was subtracted from the NPA based estimate of total revenue received from retail prescription sales of each drug. This provided a measure of pharmacies' charges or margin on each drug during each time period. A pharmacy charge, or margin, was calculated at both the per prescription and the per unit levels.

B. Margin per Prescription

Trends in average retail prescription price, ingredient cost, and "margin" received by retail pharmacies are shown in Figure 13. The average retail prescription price in nominal dollars for the drugs included in the analysis rose from \$10.73 in 1981 to \$20.78 in 1988. During the same period, the average cost to pharmacies for the drug product dispensed in each prescription increased from \$6.94 to \$15.29. The difference (margin) between the average prescription price and the cost to pharmacies for the dispensed ingredients increased from \$3.79 in 1981 to \$5.48 in 1988. The consumer price index values were used to adjust the nominal dollar margin per prescription to real dollars in term of 1981 dollars. Figure 14 shows the trends for the same variables when adjusted to 1981 constant or real dollars. In 1981 real dollars, pharmacies' 1988 dollar margin per prescription equalled only \$4.12 in 1981 dollars, an increase of only \$0.33 from the \$3.79 margin per prescription in 1981.

When only single source drugs were considered the average prescription price in nominal dollars increased from \$18.64 in 1981 to \$33.81 in 1988, an increase of 81.4 percent (Figure 15). Average ingredient cost to pharmacies for single source prescriptions increased from \$14.13 to \$27.60 an increase of 95.3 percent. Pharmacies' average margin on single source prescriptions increased from \$4.51 to \$6.21, a 37.7 percent increase.

The average price of prescriptions for multiple source drugs increased from \$9.78 in 1981 to \$15.40 in 1988. The average cost to pharmacies for the ingredients in the average prescription for a multiple source drug increased from \$6.08 to \$10.21. The pharmacies' average margin on multiple source prescriptions increased from \$3.70 to \$5.19. Figure 16 shows the trends for these multiple source prescription price components. Overall, the average retail price for prescriptions for multiple source drugs increased 57.5 percent, manufacturers' product prices for the ingredients in multiple source prescriptions increased 67.9 percent between 1981 and 1988, and the average pharmacy margin increased 40.3 percent.

C. Margin Per Unit

The dollar margin on each pharmaceutical unit was also analyzed. Figure 17 shows the trend in unit dollar margin for all drugs in nominal and constant dollars. Figures 18 and 19 show trends in pharmacies' unit dollar margin on single source and multiple source drugs, respectively, in nominal and constant dollars.

In nominal dollars, the average pharmacy margin per unit for all drugs was \$.06 in 1981 and grew to \$.10 by the end of 1988. When adjusted to constant 1981 dollars, however, the margin was only \$.07 per unit in 1988. The average pharmacy margin per unit for multiple source prescriptions was consistently less than the average margin per unit for single source prescriptions. In 1981, for example, the multiple source products yielded a dollar margin per unit of \$.06 and single source products yielded a \$.07 per unit margin. These dollar per unit margins had grown, respectively, to \$.09 and \$.12 by the end of 1988.

D. Percent Margins

Pharmacy margins as a percent of the average retail prescription price were also examined. This percent margin was calculated by dividing the average pharmacy dollar margin per prescription by the average retail prescription price. The pharmacy percent margins for 1981 to 1988 are shown in Figure 20. Pharmacies' margins as a percent of consumers' expenditures on prescription drugs decreased from 35.3 percent in the first half of 1981 to 26.4 percent in the last half of 1988. During this same period the pharmacies' average dollar margin per prescription increased from \$3.79 to \$5.48, while the average retail prescription price increased from \$10.73 to \$20.78 (Figure 13).

When expressed as a percent of prescription price, pharmacies' average percent margin on prescriptions for multiple source drug products tended to be greater than the percent margin on prescriptions for single source drugs. This was true despite the finding that pharmacies' average dollar margin on multiple source prescriptions was less than that for single source prescriptions. This can be explained by the fact that the average price of prescriptions for the multiple source drugs was much less than for single source drugs.

However, the trend in the pharmacies' margins as a percent of prescription sales was down in both cases. The percent margins on prescriptions for multiple source prescriptions decreased from 37.8 percent in 1981 to 33.7 percent in 1988. Percent margins on prescriptions for single source drugs declined from 24.2 percent in 1981 to 18.4 percent in 1988 (Figure 21).

VI. PHARMACEUTICAL MARKET CHANNELS

The channels of distribution for prescription pharmaceuticals are in a dynamic state of change. During the three decades preceding the 1980s a fairly simple market structure was in place for prescription drugs. The traditional market channels for prescription pharmaceuticals were similar to the channels of distribution in other industries. The basic core of the distribution chain involved a flow from manufacturer to wholesaler to retailer (pharmacy) to consumer (Figure 22). However, the cost management pressures of the 1980s led to emergence of new health care delivery structures (e.g., health maintenance organizations [HMOs], preferred provider organizations [PPOs], and buying groups) which have significantly changed the organization of the health care market.

A. Traditional Market Channels

Prescription pharmaceuticals have not escaped this restructuring of the healthcare marketplace. A number of new market channels and variations to traditional market channels for prescriptions have evolved. An overview of traditional market channels for prescriptions (Figure 22) is presented to set the stage for discussion of the variety of current variations in market channels for prescriptions.

1. Manufacturers. More than 750 companies in the United States have been estimated to be engaged in the sale of finished prescription drug products to wholesalers, pharmacies, and practitioners (Pharmaceutical Manufacturers Association, 1990). Some pharmaceutical companies do not manufacture the finished drug product, rather they contract with a manufacturer to make the product which is then sold under their own label. This type of pharmaceutical company may be referred to as a "distributor."

Many of the firms marketing non-originator multiple source products are technically distributors rather than manufacturers for some or all of their product line. Even some single source products may be made by another pharmaceutical company on contract for the original labeler.

A manufacturer may distribute products by either its own direct distribution system or through pharmaceutical wholesalers. A direct distribution manufacturer may ship all products from a centralized distribution center or it may use a series of decentralized warehouses to ship products to pharmacies within a specific region. Manufacturers who do not have their own distribution system must work with pharmaceutical wholesalers to provide adequate distribution of drug products to pharmacies. The distribution policies established by a given manufacturer may include wholesale only, direct only, or wholesale and direct sales.

The price charged by a manufacturer for a drug product is set by the manufacturer. The timing, frequency, and amount of price changes are usually at the manufacturer's discretion. In the traditional market system a manufacturer sets at least four specific prices: the wholesaler price (WP); the direct price (DP); the list price; and contract prices to special channels of distribution.

The wholesaler price (WP) is the initial transaction price listed on an invoice when a wholesaler purchases a drug product from a manufacturer. The net, or actual, wholesaler acquisition cost may include reductions to the invoiced price in the form of discounts, rebates, chargebacks, promotional allowances, or other allowances based on volume of the product purchased, total dollar volume of the business with the manufacturer, or other considerations.

The direct price (DP) is the price a pharmacy pays the manufacturer when purchasing a drug product directly from the manufacturer. The direct price is usually not discounted except for timely payment of the invoice. Manufacturers selling direct to pharmacies usually require a minimum dollar value per order (e.g., \$100 or \$250) and in some cases a minimum quantity of purchased items (e.g., 6 bottles of 100 dosage units). The pharmacy may, at times, have to pay shipping costs of the drug products in addition to the direct price.

The list price is set and published by each manufacturer. This list price is the manufacturer's suggested price that the wholesaler should charge a pharmacy for the drug product. Wholesalers update their price database with manufacturers' list prices on virtually a constant basis. Each wholesaler then determines the wholesale list price they will charge pharmacies which may or may not be the manufacturer's list price. Wholesalers are free to set the actual price they charge a pharmacy based on competitive forces in their marketplace.

2. Wholesalers. Nearly 300 wholesale distribution centers are operated by more than 86 different companies in the United States (National Wholesale Druggists Association, 1990). The core function of wholesalers in the pharmaceutical market channel is the concentration-dispersion function (Fay, 1983). Wholesalers concentrate the buying power of many retail pharmacies into a single purchase from a pharmaceutical manufacturer. Wholesalers, then, disperse products to many pharmacies in their service area in an efficient and timely manner. This process reduces the number of sales transactions for the manufacturer and improves the purchasing power of the wholesaler on behalf of its customers (i.e., independent, chain, and hospital pharmacies).

For the individual pharmacy the wholesaler reduces the number of transactions necessary for purchasing a full line of drug products from a wide variety of manufacturers. An individual pharmacy would have to purchase from several hundred manufacturers on a weekly or monthly basis to replace the function served by a wholesaler. In most metropolitan areas, wholesalers can deliver drug products with same day service (when necessary) and nearly all communities have access to next day service. Direct purchases from pharmaceutical manufacturers often will not allow such timely service and when available there may also be a minimum order quantity as well as significant transportation or delivery charges in addition to the drug product cost.

Wholesalers serve many other related functions in addition to the product distribution role. With the advent of automation and computerization, pharmaceutical wholesalers have developed a number of value-added services for their pharmacy customers such as: automated accounts receivables, customized price stickers, inventory control, electronic order entry, management information and product movement reports, third party claims processing, retail pricing guides, and pharmacy computer systems.

Pharmacy wholesalers handled 49.1% of the domestic pharmaceutical products shipped to pharmacies in 1977. In 1981 wholesalers' volume had increased to 59.2% of shipments from manufacturers and by 1987 wholesalers accounted for 68.8% of such shipments (Pharmaceutical Manufacturers Association, 1990). Wholesalers have become an increasingly important component of the distribution channel while manufacturers' direct sales and shipments have been declining. During the same period that the percentage of pharmaceuticals being shipped through wholesalers was increasing, the net operating profit of wholesalers was decreasing as a percentage of their sales volume. Wholesale net operating profit in 1981 was 2.8% of sales and by 1987

had declined to 2.0% of sales (National Wholesale Druggists Association, Operating Survey, 1989).

Wholesale prices to pharmacies may vary based on geographic region; total dollar volume of purchases per year; or other factors. There are three major drug price database services available in the United States: the Master Drug Data Base (MediSpan, Ind., Indianapolis, IN); the Blue Book (First Data Bank, San Bruno, CA); and the Red Book (Medical Economics Co., Oradell, NJ). Each of these drug price database services collects list price data from a large sample of wholesalers (i.e., 30 to 60 wholesalers) on a periodic basis (usually weekly). Independently, then, the drug price databases calculate an "average" wholesale price (AWP) for each specific product (i.e., drug entity strength, dosage form, manufacturer, and package size). This average of manufacturers' suggested list prices collected from many wholesalers is known as AWP and has come to be a pricing reference point which serves as a basis for establishing how much the pharmacy will pay a wholesaler for a drug product and how much a third party payor will reimburse pharmacies for drug product cost in filling a prescription.

3. Pharmacies. There are approximately 55,000 pharmacies in the United States (National Association of Boards of Pharmacy, 1989). Traditionally, pharmacies buy pharmaceutical products either from a wholesaler or direct from the manufacturer or distributor. Although direct purchases may appear on the surface to be more economical, this process may add additional costs for both the manufacturer and the pharmacy. The manufacturer which sells direct must establish one or more distribution centers to interface with 55,000 pharmacies rather than about 80 wholesalers. This expanded distribution effort will add to the cost of the product.

Pharmacies buying direct must establish business accounts with the manufacturers from which they intend to purchase drug products. A typical pharmacy would have to have accounts with several hundred manufacturers versus only one or two wholesalers to serve the same function. If a pharmacy placed orders monthly with each of 600 manufacturers, it would produce more than 7,200 purchase transactions per year. If the same pharmacy ordered the same products through two wholesalers but on a weekly basis, it would generate only 104 transactions per year. This increased volume of transactions and individual accounts payable would add significantly to the pharmacy's cost of doing business.

Another major challenge to an efficient pharmacy operation is effective inventory control. A pharmacy is expected to have in inventory a full line of drug products when presented with a prescription by the consumer. Appropriate quality health care dictates that it is not acceptable to ask a patient to come back next week for their prescription because the medication is not in stock or has been back-ordered. The typical pharmacy must have in stock 3,000 to 7,000 different drug products when considering drug entity, dosage form, strength, and manufacturer. The average independent pharmacy in 1988 had prescription inventory worth \$53,931 which represented 10.2 percent of retail prescription sales (Lilly Digest, 1989). Even though a broad line of products is required, pharmacies must also work to minimize the size of their inventory. Excessive inventory on hand will significantly reduce cash flow and may be a contributor to an inefficient, or even an unprofitable, pharmacy operation. Efficient pharmacies, then, require a channel of distribution that will allow purchase of small or reasonable quantities of products that can be delivered in a timely manner. The wholesaler serves as the primary source of drug products for most community and institutional pharmacy settings.

Pharmacies may be categorized into several groups based upon characteristics of the consumers served (Figure 23). The term "consumer" is used to mean the person who is the end user of a product, or literally the one that "consumes" the product. The most common distinction made is to separate pharmacies that serve outpatients, or ambulatory consumers in a community setting, and those that serve inpatients in an institutional setting.

Competing pharmaceutical delivery channels for ambulatory patients may include: independent community pharmacies, chain community pharmacies, mail order pharmacies, HMO pharmacies; hospital outpatient dispensaries, and non-pharmacy dispensers. Non-ambulatory patients usually have their pharmaceutical product needs met by pharmacies within short or long term hospitals. Patients residing in long term care facilities may have their pharmaceutical needs supplied by a pharmacy that specializes in long term care or by a traditional chain or independent community pharmacy that services long term care facilities. The group of persons whose healthcare is delivered directly by a government agency such as active military personnel, veterans, and native Americans covered by the Indian Health Service can be considered as an additional set of patients whose pharmaceutical needs are served by a unique delivery channel.

B. Changing Market Channels

Many other intermediaries may influence the delivery channel for pharmaceuticals even though such forces do not directly take title to, or engage in actual distribution of the product. These other influences include prescribers, third party payors (both private and government), HMOs and PPOs, and employers.

The practitioner determines the drug entity and regimen to be prescribed for a patient. The prescriber may influence the price of the prescription most notably by whether or not a patent-protected single source product or an off-patent multiple source product was prescribed. If a multiple source product was prescribed, the prescriber may influence the price a consumer would have to pay for the medication by either allowing or prohibiting drug product selection. State laws vary widely with respect to how substitution may be permitted or prohibited.

Private and government third party programs covering prescription drugs may affect pharmaceutical delivery channels by their benefit and policy design, by reimbursement criteria, by establishing an approved provider network, or by developing their own pharmacy. Employers also may exert influence over pharmaceutical delivery channels through their role as a sponsor or financer of a prescription drug program.

In the past two decades third party coverage of prescriptions has grown substantially. Direct third party programs are those which require the pharmacy to dispense the medication to the patient and collect reimbursement directly from the third party insurer, administrator, or plan sponsor. Direct third party payments covered 11.9% of all retail prescriptions in 1969, 25.4% by 1980, and 38.8% by 1988 (Siegleman and Feierman, 1989). Approximately one-half of all direct third party prescriptions (17.9% of all retail prescriptions) are covered by Medicaid programs and the remainder are covered by private third party programs (Siegleman and Feierman, 1989). With this growing role in financing prescription drug coverage has come an interest among third party payors in attempting to manage the amount and rate of growth in prescription drug expenditures.

Alternative market channels have emerged in an effort to find delivery mechanisms that provide increased efficiency and control mechanisms for managing health care utilization and expenditures. Changing market channels involve pharmacy providers of all types. Examples of how several types of pharmacies or pharmaceutical distribution systems are adapting to changes in pharmaceutical market channels are described and are illustrated in Figure 23. These alternative delivery mechanisms are, in most cases, efforts to increase drug distribution efficiency and decrease drug product acquisition costs in order to effectively manage the growth of prescription drug expenditures.

1. Independent Community Pharmacies. Approximately two-thirds of the nation's community pharmacies are independently-owned small businesses. These pharmacies purchase the vast majority (two-thirds to four-fifths) of their pharmaceutical products from one or two wholesalers in their local area. The remaining product purchases are made from a variety of sources including: direct from multiple source and single source manufacturers and through retail pharmacy buying groups. In 1988 more than one-half of all independent pharmacies were found to be participating in one or more retail buying groups (Tang, 1988).

Retail pharmacy buying groups have been formed to give independent and small chain pharmacies increased buying power. A buying group acts as an agent of its members and attempts to use the aggregated purchasing power as a means to obtain better prices from pharmaceutical companies. Although buying groups may develop warehousing capability, most often the buying group will contract with a wholesaler to be the channel of distribution from manufacturer to pharmacy. Retail buying groups have been formed to give independent and small chain pharmacies increased buying power for the purpose of negotiating contractual prices from pharmaceutical companies. Independent pharmacies

through retail buying groups have very little leverage over price when purchasing pharmaceuticals. The limited success to date has come by forcing manufacturers and distributors of generically equivalent multiple source products to compete through a bid process. Retail buying groups have attempted to get manufacturers of single source, patent-protected products to negotiate on price, but have had little, if any, success (Mincy, 1989).

2. Chain Community Pharmacies. Chain pharmacies may range from as few as four or five stores to more than two thousand stores under the same ownership. Chain pharmacies account for about 40% (21,000 stores) of the nation's pharmacies (National Association of Chain Drug Stores, 1989). Most large chains have altered the traditional market channels by creating their own warehouses to replace, in many ways, the wholesaler. A chain can buy in much larger quantities than individual pharmacies resulting in lower prices due to volume discounts. Although the chain corporate warehouse may buy a larger proportion of their drug products direct from manufacturers than do other retail pharmacies, the chain is performing the "wholesaling" function which adds additional expense. Most chains add a "warehouse charge" onto the actual drug product cost to determine the transfer price of the product when it is shipped from the chain warehouse to a particular pharmacy. Not all chain pharmacies operate a centralized warehouse. Instead, some chain pharmacies purchase their products primarily through wholesalers and direct from the manufacturer in a manner similar to independent community pharmacies. Many small chain pharmacies (4 to 50 stores under the same ownership) also participate in retail buying groups with independent community pharmacies.

3. Hospital and Other Institutional Pharmacies. Hospital pharmacies appear to have been the most successful group in influencing prescription prices by exerting control over the channels of distribution. Hospital

pharmacies have been found to receive substantially lower prices than community pharmacies in many cases (American Druggist, 1989). Manufacturers comment that some hospitals receive discounts because of their non-profit status. Others suggest that the lower prices are promotional prices to get physicians and patients started on their products in the hospital so that use will continue on an outpatient basis. Hospital buying groups have been able to negotiate or obtain bid prices on both multiple source and single source products. Much of their success comes from the control hospitals have over the prescribing and dispensing of medications in hospitals. Drug formularies established by pharmacy and therapeutics committees of physicians and pharmacists establish a framework for both "generic" and "therapeutic" product interchange within the hospital. By having acceptable substitute products compete in a bid purchasing process, hospitals are able to obtain more competitive pricing from pharmaceutical manufacturers.

Long term care pharmacies and HMO pharmacies are settings that serve patients in a different environment. The transferability of this type of control over the drug distribution process has not been fully tested in the ambulatory environment. Some HMOs, particularly staff model HMOs, have been able to develop and implement generic and therapeutic substitution policies and in turn use this leverage to get better prices from pharmaceutical companies. If an HMO has its own pharmacies, it can operate a bid purchasing program to get competitive pricing. Many HMOs, however, contract with a network or chain of pharmacies and thus never purchase directly, or take title to, drug products prior to dispensing to the patient. In some cases though, the network model HMOs have been able to negotiate "rebates" directly to the HMO based on a contractual agreement to influence the prescribing and dispensing of a certain company's products through the HMO preferred

prescribers and pharmacies. Pharmacies serving a large number of long term care patients may also be able to influence the distribution process through formularies in a manner that results in competitive prices from pharmaceutical companies.

4. Mail Order Pharmacies. Some patients prefer the convenience of prescriptions being delivered at home through the mail. Mail order pharmacies are a high-volume retail pharmacy distribution center. Some economies of scale are achieved because of the high volume operation and automation found in most mail order pharmacies. Mail order prescription programs typically alter the drug benefit design by providing the patient with a 90-day supply of medication whenever possible and by substituting lower-cost generic medications for brand name drug products whenever permitted by the patient's physician. Most mail order pharmacies can obtain more competitive prices from pharmaceutical companies because of the large volume of purchases by a single buyer and direct purchase from the manufacturer with shipment to their own warehouse, therefore bypassing the wholesaler. Also, mail order pharmacies have leverage over manufacturers' prices for multiple source products because of their ability to determine the generically equivalent version of a drug product that will be dispensed.

5. Non-pharmacy Dispensers. Non-pharmacy dispensers include physicians, dentists, other practitioners, physician assistants, nurse practitioners, and in some cases other office personnel in the physician's office. Emergency rooms, urgent care centers, surgical outpatient clinics, and ambulatory care centers are other examples of non-pharmacy dispensers that compete for ambulatory patients in the retail pharmacy market. Non-pharmacy dispensers are not always subject to the same labeling and dispensing laws and regulations that govern pharmacies at the state level. Many of these non-

pharmacy dispensers maintain a limited supply of drug products (40 to 100 drug entities, strengths, and dosage forms). Often these drug products are in unit-of-use packages for dispensing directly to patients. Such unit-of-use dispensing packages are prepared by certain companies known as "repackagers." Repackagers buy drug products from pharmaceutical companies in bulk containers (100s, 500s, 1000s, or even 50,000s) and repackage the drug products into unit-of-use dispensing packs with general patient instructions on the label.

6. Government Pharmacy Programs. Federal and state governments are involved in both the financing and the delivery of health care to certain segments of the population. Health care is delivered directly to active military personnel, veterans through the Veterans Administration, and to native Americans through the Indian Health Service. The government agencies which deliver pharmacy services actually purchase, and take title to, prescription drug products and serve a major role in the drug distribution process. The Veterans Administration, the military, and many state hospital systems have developed bid purchasing and contracting programs for acquiring pharmaceuticals. The Veterans Administration and military health care systems also operate their own warehouses for purchasing and distribution of pharmaceuticals. Government-delivered health care systems, in most cases, have been able to obtain very competitive prices on pharmaceuticals. The leverage to obtain these contract prices is derived from several factors, including: consideration of government as a "special class" of purchaser; purchasing and taking title to product in large quantities; practice guidelines that affect prescribing patterns; and formulary systems that affect prescribing and dispensing patterns.

Government-financed health care programs, such as Medicaid, have not been as successful as government-delivered health care programs in obtaining

competitive prices on pharmaceutical products. Medicaid, for example, does not actually purchase, or take title to, products from pharmaceutical manufacturers and distributors. Medicaid purchases prescriptions through retail pharmacy providers and the reimbursement to the pharmacy has been the primary focus of expenditure control. And as it is change in manufacturers' prices, and not change in retail pharmacy margins, that has been driving the growth in prescription drug expenditures, Medicaid programs, therefore, end up paying for drug products at prices comparable to independent and chain community pharmacies participating in the Medicaid program. Such prices are usually much higher than the prices available to state hospitals, the military, or the VA system even though Medicaid programs, which pay for nearly 18% of all retail prescriptions, are the largest single purchaser of outpatient prescriptions in most states.

State Medicaid programs have attempted various mechanisms to manage their drug expenditure rates. Limiting the prescription reimbursement rate to community pharmacies has not been effective in controlling either the amount paid for, or the inflation rate of, prescription pharmaceuticals. Retail pharmacy fees under Medicaid programs increased by 15.2% between 1982 and 1988. During this same period the drug product ingredient costs increased 86.5% and the average prescription price went up 62.8% (National Pharmaceutical Council, 1989). Many states operate formulary programs aimed primarily at drug product selection among generically equivalent drug products. Most state Medicaid programs have not developed formularies of the same type as those commonly used in hospitals which facilitate interchange among therapeutically equivalent products and consequently serve as a means of encouraging price competition among single source products. One program of this type was developed by the Kansas Medicaid program, but the impact of that

multiple sources after 1981, regardless of whether the analysis was based on the indices or SAAC. Both indicated greater average annual change in prices of originator multiple source drugs than in non-originator multiple source drugs. Both approaches also indicated that when multiple source drugs were separated based on whether they became available from multiple sources before 1981 or after 1981, originator drugs in each category had greater average annual change in prices than did non-originator drugs.

The fact that SAAC in the prices for the multiple source drugs was less than that of the single source drugs, even though the average change in the price indices indicated the opposite, can be explained by the effect of holding the product mix and weights constant in the price index. Many non-originator products introduced after 1984 are excluded from the index but were represented in the simple averages. Non-originator products also increased their share of the multiple source drug market after 1984. Therefore, the simple average better represents the average price of the multiple source drugs when such changes are considered. On the other hand, the fixed weight index reflects the finding that originator drugs (which were more likely to remain in the index) increased at a greater annual rate than single source drugs, a finding supported by both the indices and simple average changes.

In comparing the changes in prices at the manufacturer and retail levels, analyses based on the indices and SAAC provided the same conclusions for composite changes (i.e., single source and multiple source drugs combined and for single source drugs only). The average annual change in manufacturers' prices for all drugs combined and for single source drugs alone were greater than the changes in the corresponding retail price indices.

The average annual changes in the manufacturer price index for multiple source drugs was greater than the changes in the retail price index for

program has not been thoroughly evaluated (Barton, 1989). Other states, for example, California, have seriously considered volume purchase plans whereby the state would purchase and take title to drug products. The state would then contract with wholesalers to distribute the drug products to community pharmacies. There is a need for further research to examine the alternatives available to Medicaid programs for obtaining more competitive prices in the pharmaceutical distribution channels.

VII. SUMMARY

The elderly population is particularly affected by the continuing rapid rise in drug prices noted in this analysis. In 1977, 75 percent of the population aged 65 or older used prescription drugs, compared to 56 percent of the population under age 65. Further, aged people who used drugs had more than twice the number of prescription as nonaged users had. The elderly often take drugs for longer periods due to a higher incidence of chronic conditions requiring continuous drug therapy. The higher use of prescription drugs is reflected in consumption patterns of households. "Aged households" (those whose reference person was 65 years or older) spent almost three times as much out of pocket for prescription drugs in 1988 as did other households. Further, at 6.5 prescriptions per year, out of pocket spending by aged households for drugs increased twice as fast between 1972 and 1988 as did such spending by nonaged households.

While it may be difficult to determine a direct relation between rising costs and the proper use of prescriptions by an individual, it can be assumed that continuing increases in prescription costs for the elderly could exacerbate financial access to drug therapy and known problems with compliance by the elderly. In turn, noncompliance could undermine the intended outcomes

of the drug therapy thus resulting in outcomes like adverse drug reactions leading to admission or readmission to a hospital or nursing home.

A. Expenditures by the Elderly

As the analysis indicates, the elderly population, age 65 and over, was estimated to account for approximately 34.3 percent of the \$26.5 billion in total 1988 retail expenditures for prescription drugs. Additionally, a total of 104 drug entities (11.4 percent of all drug entities) accounted for 80 percent of expenditures by the same population. Of the entities studied, 63 were multiple source and the other 41 were classified as single source drug entities. Among the elderly's prescription expenditures, multiple source drugs accounted for 44.2 percent, single source entities accounted for 35.9 percent, and the remaining 19.9 percent were not classified for this analysis.

B. Price Changes

Laspeyres price indices were developed for selected categories of pharmaceuticals and for all pharmaceuticals. Analysis of changes in those indices and the simple average annual change (SAAC) in prices at the manufacturer and retail level were analyzed. In four out of five comparisons of average change in price across drug categories, analyses based on the price indices and SAAC lead to similar conclusions. The one instance in which the alternative approaches lead to different conclusions was when the index showed greater average annual change in the prices of multiple source drugs than for single source drugs when the SAAC showed the reverse. The above held true regardless of whether the analysis was at the manufacturer or retail level. Therefore, the following applies to manufacturer and retail prices.

Drugs that were available from multiple sources prior to 1981 were found to have lower average change in prices than drugs that became available from

Appendix B: Semi-Annual Drug Price Data

multiple source drugs. However, the simple average annual change in multiple source drug prices at manufacturer and retail levels were equal. Examination of the differentials between manufacturer and retail price changes for originators and non-originator drugs provides a likely explanation. When manufacturer and retail price changes for pre-1981 originator, post-1981 originator, and all originator multiple source drugs were compared, the price indices and the simple average annual change in prices at the manufacturer level were greater than the changes at the retail level. However, in similar comparisons of the non-originator multiple source drugs the opposite held true. In other words, manufacturer prices experienced less change than did retail prices.

Between 1981 and 1988 manufacturers' prices for the entire group of drugs in the index examined increased at an average annual rate of 9.1 percent when the mix of products marketed in 1984 was held constant. When changes in mix of products and product market share were considered, product prices at the manufacturer level increased at a lower average annual rate, 6.8 percent.

The average annual change in retail prices of all the drugs when the mix of products marketed in 1984 was held constant was 7.2 percent. When changes in product mix and market share were included, retail prices increased at an average annual rate of 6.6 percent.

The average annual changes in prices at the retail level tended to be lower than those at the manufacturer level. The one exception was that average annual change in manufacturers' prices for non-originator multiple source drugs tended to be smaller than the average annual change in retail price for non-originator drugs. In all other instances the average annual change in manufacturer prices was greater than the change in retail prices.

C. Pharmacy Margins

Analysis of pharmacies' margins was undertaken to determine if increased pharmacy markups were responsible for the increases in retail drug prices. Data from IMS America Ltd.'s National Prescription Audit and U.S. drugstores databases were used to determine trends in pharmacies' "margin" or the difference between what pharmacies paid for pharmaceuticals and the retail prices paid by consumers. The "margin" does not represent profit but the total dollars available to pharmacies after paying for the ingredients in prescriptions that must be used to pay all operating expenses such as rent, employee wages and salaries, and utilities before generating any profit. The average prescription price for all the drugs examined increased from \$10.73 in 1981 to \$20.78 in 1988. During the same period, the average cost to pharmacies for the drug product dispensed in a prescription increased from \$6.94 to \$15.29. As a result of the above changes, pharmacies' margins increased from \$3.79 in 1981 to \$5.48 in 1988. However, the dollar margin in 1988 was equivalent to only \$4.12 in 1981 constant dollars, an increase of only \$0.33 in real terms over a seven-year period. This compares with an increase of \$4.56 in product costs in 1981 real dollar terms.

There was a small increase in pharmacies' dollar margin per prescription, the difference between what pharmacies paid for drugs and their charges to customers. However, pharmacies' profits, the amount remaining after covering all operating expenses such as rent, wages, and utilities have decreased (NACDS Resource Guide). This indicates that pharmacies have not been able to increase their margins at a rate equivalent to the increase in their operating costs. As a result pharmacies' profits have been forced down. Pharmacies' dollar margins as a percent of prescription price on all the drugs examined decreased from 35.3 percent in 1981 to 26.4 percent in 1988. The average



dollar margin per prescription for multiple source drugs was less than that for single source drugs. Yet, since the average price of prescriptions for multiple source drugs was less than that of single source drugs, the average percent margin on prescriptions for multiple source drugs was higher than that of single source drugs. Pharmacies' average percent margins on prescriptions for both single source and multiple source drugs declined between 1981 and 1988. Between 1981 and 1988 the percent margin received by pharmacies on prescriptions for multiple source drugs decreased from 37.8 percent to 33.7 percent and from 24.2 percent to 18.4 percent for single source drugs.

D. Market Channels

The traditional market channel of manufacturer to wholesaler to retailer, remains the dominant pattern in the pharmaceutical distribution system. Over the last decade, wholesalers have expanded their role by increasing the proportion of pharmaceuticals passing through wholesalers, from 50 percent to nearly 70 percent and by providing direct administrative services to retail pharmacies. However, the analysis also indicated the presence of a dynamic state of change in these channels. For example, independent and chain community pharmacies are experiencing competition from new retail delivery channels including: mail order pharmacies, hospital outpatient departments, HMO pharmacies, and non-pharmacy dispensers. Both private and government third party programs are becoming more aggressive in their efforts to contain health care costs in general. Finally, the payors of health care are also concerned with the amount and inflation rate of prescription drug expenditures and are making an effort to control costs.

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Tables

Table 1. Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly¹

Drug	Dollar Expenditure		Percent Expenditure Age 65+	Cum. % Expend. Age 65+
	All Ages	Age 65+		
Ranitidine	935,739,814	333,004,593	3.7	3.7
Diltiazem	504,353,826	305,115,908	3.4	7.0
Nitroglycerin	384,833,835	267,098,800	2.9	10.0
Nifedipine	381,838,256	247,342,314	2.7	12.7
Hydrochlorothiazide/ Triamterene	408,770,290	228,980,160	2.5	15.2
Captopril	402,994,712	218,483,986	2.4	17.6
Cimetidine	564,985,873	194,038,748	2.1	19.7
Potassium	310,679,528	193,090,400	2.1	21.9
Verapamil	330,880,429	164,628,482	1.8	23.7
Enalapril	359,064,589	162,660,927	1.8	25.5
Atenolol	392,797,623	161,402,114	1.8	27.2
Dipyridamole	214,044,862	149,892,707	1.6	28.9
Theophylline	314,314,444	134,576,728	1.5	30.4
Naproxen	556,930,678	132,866,762	1.5	31.8
Glyburide	239,592,379	121,771,485	1.3	33.2
Piroxicam	331,651,532	119,837,306	1.3	34.5
Insulin	277,398,817	119,237,712	1.3	35.8
Lovastatin	241,206,306	113,939,829	1.3	37.1
Metoprolol	236,256,654	110,980,374	1.2	38.3
Furosemide	154,885,959	109,621,586	1.2	39.5
Digoxin	131,884,879	108,629,151	1.2	40.7
Acetaminophen/ Propoxyphene	279,547,117	108,587,448	1.2	41.9
Albuterol	322,318,287	107,264,625	1.2	43.1
Levodopa/Carbidopa	117,840,497	103,596,880	1.1	44.2
Timolol	135,556,573	95,802,660	1.1	45.3
Propranolol	256,718,514	95,212,330	1.0	46.3
Alprazolam	435,542,406	94,242,666	1.0	47.3
Sulindac	222,152,155	91,436,938	1.0	48.4
Quinidine	119,713,705	88,455,798	1.0	49.3

Table 1-continued. Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly¹

Drug	Dollar Expenditure		Percent Expenditure Age 65+	Cum. % Expend. Age 65+
	All Ages	Age 65+		
Isosorbide Dinitrate	117,654,700	86,389,746	1.0	50.3
Methyldopa	126,242,520	83,717,777	0.9	51.2
Pentoxifylline	108,177,570	79,837,427	0.9	52.1
Sucralfate	184,399,939	74,583,875	0.8	52.9
Triazolam	164,653,530	71,536,855	0.8	53.7
Cephalexin	321,874,002	67,545,967	0.7	54.4
Prazosin	141,703,200	66,548,357	0.7	55.2
Estrogenic Substance	287,652,771	63,260,372	0.7	55.9
Levothyroxine	148,522,077	62,191,113	0.7	56.5
Nadolol	123,164,090	60,676,050	0.7	57.2
Tamoxifen	99,923,231	58,724,183	0.6	57.9
Erythromycin	403,723,520	54,837,462	0.6	58.5
Acetaminophen/ Codeine	218,521,673	54,160,157	0.6	59.1
Glipizide	93,695,005	51,606,834	0.6	59.6
Ibuprofen	218,939,910	50,771,106	0.6	60.2
Gemfibrozil	134,541,889	50,706,416	0.6	60.7
Procainamide	67,907,593	50,028,209	0.6	61.3
Terfenadine	281,131,546	45,287,481	0.5	61.8
Chlorpropamide	74,135,443	44,849,278	0.5	62.3
Hydrochlorothiazide/ Methyldopa	56,938,983	44,069,862	0.5	62.8
Clorazepate	130,544,257	43,989,076	0.5	63.3
Warfarin	70,865,300	43,644,946	0.5	63.7
Famotidine	129,622,432	41,642,256	0.5	64.2
Allopurinol	78,077,377	40,705,836	0.4	64.6
Cefaclor	404,317,730	39,502,247	0.4	65.1
Ciprofloxacin	114,076,173	39,096,642	0.4	65.5
Metaproterenol	94,531,172	38,856,815	0.4	65.9
Phenytoin	124,897,151	38,714,818	0.4	66.4
Diazepam	229,881,801	38,339,429	0.4	66.8
Labetalol	65,619,071	37,579,395	0.4	67.2

Table 1-continued. Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly¹

Drug	Dollar Expenditure		Percent Expenditure Age 65+	Cum. % Expend. Age 65+
	All Ages	Age 65+		
Clonidine	77,194,990	36,027,542	0.4	67.6
Bromocriptine	61,996,580	35,794,717	0.4	68.0
Lorazepam	170,569,254	35,554,529	0.4	68.4
Indomethacin	117,078,774	34,601,023	0.4	68.8
Cholestyramine	71,066,646	34,543,344	0.4	69.1
Doxycycline	104,887,484	34,349,179	0.4	69.5
Ergoloid	38,424,233	34,245,098	0.4	69.9
Amiloride/ Hydrochlorothiazide	65,478,806	33,001,122	0.4	70.3
Beclomethasone	134,072,820	32,538,756	0.4	70.6
Hydrochlorothiazide	62,882,187	31,340,043	0.3	71.0
Haloperidol	70,280,370	31,307,078	0.3	71.3
Metoclopramide	77,826,537	31,204,809	0.3	71.6
Diclofenac	65,657,110	30,377,115	0.3	72.0
Chlorthalidone/ Atenolol	72,095,897	29,642,589	0.3	72.3
Pilocarpine	35,690,555	28,480,395	0.3	72.6
Norfloxacin	64,483,320	28,410,706	0.3	72.9
Temazepam	54,931,452	27,753,809	0.3	73.2
Probucol	50,138,898	26,825,012	0.3	73.5
Acetaminophen/ Hydrocodone	112,404,709	26,444,649	0.3	73.8
Acetaminophen/ Oxycodone	104,463,968	26,170,508	0.3	74.1
Cefadroxil	128,350,090	25,680,550	0.3	74.4
Sulfamethoxazole/ Trimethoprim	154,694,731	25,289,566	0.3	74.7
Nortriptyline	72,749,106	24,281,278	0.3	74.9
Ketoprofen	74,492,325	23,714,781	0.3	75.2
Betaxolol	31,241,650	23,655,740	0.3	75.5
Amitriptyline	94,460,268	23,434,880	0.3	75.7
Dipivefrine	32,669,743	23,200,157	0.3	76.0
Tolmetin	72,613,705	22,998,077	0.3	76.2

Table 1-continued. Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly¹

Drug	Dollar Expenditure		Percent Expenditure Age 65+	Cum. % Expend. Age 65+
	All Ages	Age 65+		
Acyclovir	118,170,049	22,429,541	0.2	76.5
Triamcinolone Acetonide	68,018,321	22,320,167	0.2	76.7
Amitriptyline/ Perphenazine	84,702,051	21,568,700	0.2	77.0
Pindolol	44,116,444	21,488,811	0.2	77.2
Fenoprofen	79,004,423	21,266,668	0.2	77.4
Tocainide	29,249,296	21,109,948	0.2	77.7
Disopyramide	46,287,289	20,542,890	0.2	77.9
Betamethasone	90,453,586	20,534,233	0.2	78.1
Encainide	28,947,871	20,517,556	0.2	78.3
Tolazamide	35,403,830	20,494,898	0.2	78.6
Terbutaline	50,493,965	20,492,289	0.2	78.8
Nitrofurantoin	67,313,570	20,400,842	0.2	79.0
Indapamide	45,415,769	20,128,450	0.2	79.2
Flecainide	35,044,919	19,804,444	0.2	79.5
Prednisone	56,786,985	19,611,728	0.2	79.7
Trazodone	93,707,579	19,434,464	0.2	79.9
Chlorthalidone	35,775,898	19,023,570	0.2	80.1

¹ Cumulative percent expenditures may differ from the sum of the percent expenditures for individual items due to rounding.

Table 2. Single Source Drugs Included in List of Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly¹

Drug	Dollar Expenditure	Percent Expenditure	Cum. % Expend.
	Age 65+	Age 65+	Age 65+
Ranitidine	333,004,593	3.7	3.7
Diltiazem	305,115,908	3.4	7.0
Captopril	218,483,986	2.4	9.4
Cimetidine	194,038,748	2.1	11.6
Enalapril	162,660,927	1.8	13.4
Atenolol	161,402,114	1.8	15.1
Naproxen	132,866,762	1.5	16.6
Piroxicam	119,837,306	1.3	18.0
Lovastatin	113,939,829	1.3	19.2
Metoprolol	110,980,374	1.2	20.4
Levodopa/Carbidopa	103,596,880	1.1	21.5
Timolol	95,802,660	1.1	22.6
Alprazolam	94,242,666	1.0	23.6
Sulindac	91,436,938	1.0	24.6
Pentoxifylline	79,837,427	0.9	25.5
Sucralfate	74,583,875	0.8	26.3
Triazolam	71,536,855	0.8	27.1
Prazosin	66,548,357	0.7	27.8
Tamoxifen	58,724,183	0.6	28.5
Glipizide	51,606,834	0.6	29.1
Gemfibrozil	50,706,416	0.6	29.6
Terfenadine	45,287,481	0.5	30.1
Famotidine	41,642,256	0.5	30.6
Cefaclor	39,502,247	0.4	31.0
Ciprofloxacin	39,096,642	0.4	31.4
Clonidine	36,027,542	0.4	31.8
Bromocriptine	35,794,717	0.4	32.2
Diclofenac	30,377,115	0.3	32.6
Chlorthalidone/ Atenolol	29,642,589	0.3	32.9
Norfloxacin	28,410,706	0.3	33.2

Table 2-continued. Single Source Drugs Included in List of Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly¹

Drug	Dollar Expenditure	Percent Expenditure	Cum. % Expend.
	Age 65+	Age 65+	Age 65+
Probucol	26,825,012	0.3	33.5
Ketoprofen	23,714,781	0.3	33.8
Betaxolol	23,655,740	0.3	34.0
Dipivefrine	23,200,157	0.3	34.3
Tolmetin	22,998,077	0.3	34.5
Acyclovir	22,429,541	0.2	34.8
Pindolol	21,488,811	0.2	35.0
Tocainide	21,109,948	0.2	35.2
Encainide	20,517,556	0.2	35.5
Indapamide	20,128,450	0.2	35.7
Flecainide	19,804,444	0.2	35.9

¹ Cumulative percent expenditures may differ from the sum of the percent expenditures for individual items due to rounding.

Table 3. Multiple Source Drugs Included in List of Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly¹

Drug	Dollar Expenditure	Percent Expenditure	Cum. % Expend.
	Age 65+	Age 65+	Age 65+
Nitroglycerin	267,098,800	2.9	2.9
Nifedipine	247,342,314	2.7	5.7
Hydrochlorothiazide/ Triamterene	228,980,160	2.5	8.2
Potassium	193,090,400	2.1	10.3
Verapamil	164,628,482	1.8	12.1
Dipyridamole	149,892,707	1.6	13.8
Theophylline	134,576,728	1.5	15.3
Glyburide	121,771,485	1.3	16.6
Insulin	119,237,712	1.3	17.9
Furosemide	109,621,586	1.2	19.1
Digoxin	108,629,151	1.2	20.3
Acetaminophen/ Propoxyphene	108,587,448	1.2	21.5
Albuterol	107,264,625	1.2	22.7
Propranolol	95,212,330	1.0	23.7
Quinidine	88,455,798	1.0	24.7
Isosorbide Dinitrate	86,389,746	1.0	25.7
Methyldopa	83,717,777	0.9	26.6
Cephalexin	67,545,967	0.7	27.3
Estrogenic Substance	63,260,372	0.7	28.0
Levothyroxine	62,191,113	0.7	28.7
Nadolol	60,676,050	0.7	29.4
Erythromycin	54,837,462	0.6	30.0
Acetaminophen/ Codeine	54,160,157	0.6	30.6
Ibuprofen	50,771,106	0.6	31.1
Procainamide	50,028,209	0.6	31.7
Chlorpropamide	44,849,278	0.5	32.2
Hydrochlorothiazide/ Methyldopa	44,069,862	0.5	32.7
Clorazepate	43,989,076	0.5	33.1

Table 3-continued. Multiple Source Drugs Included in List of Drugs Accounting for 80 Percent of Retail Prescription expenditures by the Elderly¹

Drug	Dollar Expenditure	Percent Expenditure	Cum. % Expend.
	Age 65+	Age 65+	Age 65+
Warfarin	43,644,946	0.5	33.6
Allopurinol	40,705,836	0.4	34.1
Metaproterenol	38,856,815	0.4	34.5
Phenytoin	38,714,818	0.4	34.9
Diazepam	38,339,429	0.4	35.3
Labetalol	37,579,395	0.4	35.8
Lorazepam	35,554,529	0.4	36.1
Indomethacin	34,601,023	0.4	36.5
Cholestyramine	34,543,344	0.4	36.9
Doxycycline	34,349,179	0.4	37.3
Ergoloid	34,245,098	0.4	37.7
Amiloride/ Hydrochlorothiazide	33,001,122	0.4	38.0
Beclomethasone	32,538,756	0.4	38.4
Hydrochlorothiazide	31,340,043	0.3	38.7
Haloperidol	31,307,078	0.3	39.1
Metoclopramide	31,204,809	0.3	39.4
Pilocarpine	28,480,395	0.3	39.7
Temazepam	27,753,809	0.3	40.0
Acetaminophen/ Hydrocodone	26,444,649	0.3	40.3
Acetaminophen/ Oxycodone	26,170,508	0.3	40.6
Cefadroxil	25,680,550	0.3	40.9
Sulfamethoxazole/ Trimethoprim	25,289,566	0.3	41.2
Nortriptyline	24,281,278	0.3	41.4
Amitriptyline	23,434,880	0.3	41.7
Triamcinolone Acetonide	22,320,167	0.2	41.9
Amitriptyline/ Perphenazine	21,568,700	0.2	42.2
Fenoprofen	21,266,668	0.2	42.4

Table 3-continued. Multiple Source Drugs Included in List of Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly¹

Drug	Dollar Expenditure	Percent Expenditure	Cum. % Expend.
	Age 65+	Age 65+	Age 65+
Disopyramide	20,542,890	0.2	42.6
Betamethasone	20,534,233	0.2	42.9
Tolazamide	20,494,898	0.2	43.1
Terbutaline	20,492,289	0.2	43.3
Nitrofurantoin	20,400,842	0.2	43.5
Prednisone	19,611,728	0.2	43.8
Trazodone	19,434,464	0.2	44.0
Chlorthalidone	19,023,570	0.2	44.2

¹ Cumulative percent expenditures may differ from the sum of the percent expenditures for individual items due to rounding.

Table 4. Percent of Total Units Used by the Elderly: Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly.

Drug	Single Source (SS), Multiple Source (MS) Classification	% Total Units Used by Elderly
Ergoloid	MS	89.1
Levodopa/Carbidopa	SS	87.9
Digoxin	MS	82.3
Pilocarpine	MS	80.5
Hydrochlorothiazide/Methyldopa	MS	77.4
Procainamide	MS	75.9
Betaxolol	SS	75.7
Pentoxifylline	SS	73.8
Quinidine	MS	73.4
Isosorbide Dinitrate	MS	73.2
Tocainide	SS	72.2
Dipivefrine	SS	71.0
Encainide	SS	70.9
Furosemide	MS	70.6
Dipyridamole	MS	69.7
Methyldopa	MS	66.7
Nitroglycerin	MS	65.8
Nifedipine	MS	64.8
Timolol	SS	63.4
Warfarin	MS	61.6
Chlorpropamide	MS	60.6
Diltiazem	SS	60.5
Tamoxifen	SS	58.8
Bromocriptine	SS	57.7
Labetalol	MS	57.3
Hydrochlorothiazide/Triamterene	MS	56.7
Flecainide	SS	56.5
Tolazamide	MS	55.6
Glipizide	SS	55.1
Captopril	SS	54.2
Probucol	SS	53.5

Table 4-continued. Percent of Total Units Used by the Elderly: Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly.

Drug	Single Source (SS), Multiple Source (MS) Classification	% Total Unit Used by Elderly
Verapamil	MS	53.3
Chlorthalidone	MS	52.6
Allopurinol	MS	52.2
Acetaminophen/Propoxyphene	MS	51.6
Potassium	MS	51.0
Hydrochlorothiazide	MS	50.8
Glyburide	MS	50.7
Amiloride/Hydrochlorothiazide	MS	50.4
Temazepam	MS	50.1
Nadolol	MS	49.3
Pindolol	SS	48.7
Cholestyramine	MS	48.6
Lovastatin	SS	47.2
Metoprolol	SS	47.0
Prazosin	SS	47.0
Disopyramide	MS	47.0
Diclofenac	SS	46.3
Clonidine	SS	46.0
Levothyroxine	MS	45.5
Enalapril	SS	45.3
Haloperidol	MS	44.9
Indapamide	SS	44.3
Norfloxacin	SS	44.1
Triazolam	SS	43.4
Terbutaline	MS	43.3
Theophylline	MS	42.9
Insulin	MS	42.5
Sulindac	SS	41.2
Chlorthalidone/Atenolol	SS	41.1
Atenolol	SS	41.1

Table 4-continued. Percent of Total Units Used by the Elderly: Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly.

Drug	Single Source (SS), Multiple Source (MS) Classification	% Total Units Used by Elderly
Propranolol	MS	40.8
Metaproterenol	MS	40.8
Metoclopramide	MS	40.6
Sucralfate	SS	40.4
Doxycycline	MS	40.4
Gemfibrozil	SS	37.7
Piroxicam	SS	36.1
Clorazepate	MS	36.1
Ranitidine	SS	35.6
Prednisone	MS	35.4
Cimetidine	SS	34.3
Ciprofloxacin	SS	34.3
Nortriptyline	MS	33.8
Triamcinolone Acetonide	MS	33.4
Albuterol	MS	33.3
Phenytoin	MS	32.2
Famotidine	SS	32.1
Tolmetin	SS	32.1
Ketoprofen	SS	31.8
Indomethacin	MS	31.3
Nitrofurantoin	MS	30.1
Acetaminophen/Hydrocodone	MS	27.6
Fenoprofen	MS	27.4
Acetaminophen/Codeine	MS	26.6
Amitriptyline/Perphenazine	MS	25.5
Acetaminophen/Oxycodone	MS	24.4
Naproxen	SS	23.8
Amitriptyline	MS	23.7
Ibuprofen	MS	23.3
Beclomethasone	MS	23.0
Estrogenic Substance	MS	22.6

Table 4-continued. Percent of Total Units Used by the Elderly: Drugs Accounting for 80 Percent of Retail Prescription Expenditures by the Elderly.

Drug	Single Source (SS), Multiple Source (MS) Classification	% Total Units Used by Elderly
Betamethasone	MS	22.5
Alprazolam	SS	21.6
Cephalexin	MS	20.5
Cefadroxil	MS	20.1
Acyclovir	SS	18.5
Trazodone	MS	17.8
Terfenadine	SS	16.1
Lorazepam	MS	14.2
Erythromycin	MS	13.3
Diazepam	MS	10.8
Cefaclor	SS	9.8
Sulfamethoxazole/Trimethoprim	MS	8.5

Table 5: Annual and Total Change in Manufacturer Drug Price Indices 1982-1988

	Percentage Change 12/81 to 12/88 ²	Average Annual Percentage Change	Annual Percentage Change						
			82	83	84	85	86	87	88
All Drugs	83.5	9.1	7.3	9.5	9.6	9.6	8.7	8.7	10.1
All Single Source Drugs	78.1	8.6	7.6	7.3	9.8	10.2	8.1	7.3	9.9
All Multiple Source Drugs	85.8	9.3	7.2	10.4	9.5	9.3	9.0	9.4	10.1
Multiple Source Originator ¹	105.0	10.8	8.9	12.9	11.5	10.5	10.4	10.2	10.9
Multiple Source Non-originator ¹	20.0	2.7	2.1	0.7	-0.5	3.3	2.1	4.7	6.3
Pre-1981 Multiple Source	77.2	8.5	6.9	9.1	8.8	8.6	8.8	8.4	9.1
Pre-1981 M. S. Originator ¹	103.0	10.7	9.5	12.5	11.7	10.1	11.2	9.4	10.2
Pre-1981 M. S. Non-originator ¹	19.6	2.6	2.5	0.2	0.0	3.7	1.9	4.2	5.9
Post-1981 Multiple Source	103.0	10.6	7.9	13.0	10.7	10.6	9.2	11.2	11.9
Post-1981 M. S. Originator ¹	106.0	10.9	8.2	13.3	11.3	11.0	9.3	11.3	11.9
Post-1981 M. S. Non-originator ¹	23.5	3.2	-0.4	4.7	-4.7	-0.1	3.6	9.6	9.4

¹ Four multisource drug entities (nitroglycerin, theophylline, potassium and quinidine) included in the multisource categories were excluded from the originator and non-originator comparisons because of unavailability of data necessary to identify originators or because the existence of different originators across dosage forms prevented calculation of summative data at the entity level.

² The column presents changes in price indices from the June through December period of 1981 to the June through December period of 1988.

Table 6. Annual and Total Change in Retail Drug Price Indices 1982-1988

	Percentage Change 12/81 to 12/88 ²	Average Annual Percentage Change	Annual Percentage Change					
			82	83	84	85	86	87
All Drugs	62.6	7.2	8.7	6.3	6.6	6.8	6.5	6.5
All Single Source Drugs	64.4	7.4	10.3	5.9	6.7	7.5	5.9	6.2
All Multiple Source Drugs	61.9	7.1	8.1	6.5	6.5	6.5	6.8	6.6
Multiple Source Originator ¹	76.3	8.4	9.2	8.3	8.1	7.9	7.9	7.5
Multiple Source Non-originator ¹	20.3	2.7	5.8	1.1	1.6	1.1	3.2	2.2
Pre-1981 Multiple Source	55.3	6.5	8.1	5.3	6.0	5.7	6.6	5.5
Pre-1981 M. S. Originator ¹	74.3	8.3	9.9	7.7	8.1	7.7	8.5	6.4
Pre-1981 M. S. Non-originator ¹	20.0	2.6	5.8	0.7	2.1	1.0	3.1	2.2
Post-1981 Multiple Source	76.6	8.5	8.1	9.1	7.7	8.1	7.0	8.8
Post-1981 M. S. Originator ¹	79.1	8.7	8.2	9.2	8.2	8.3	7.1	9.0
Post-1981 M. S. Non-originator ¹	23.5	3.1	4.8	5.6	-3.9	2.3	4.6	3.2

¹ Four multisource drug entities (nitroglycerin, theophylline, potassium and quinidine) included in the multisource categories were excluded from the originator and non-originator comparisons because of unavailability of data necessary to identify originators or because the existence of different originators across dosage forms prevented calculation of summative data at the entity level.

² The column presents change in price indices from the June through December period of 1981 to the June through December period of 1988.

Table 7: Simple Average Annual Change in Manufacturer Drug Prices 1982-1988

	Average Annual Percentage Change	Annual Percentage Change					
		82	83	84	85	86	87 88
All Drugs	6.8	6.2	9.5	7.5	7.2	6.9	5.2 5.0
All Single Source Drugs	9.2	8.9	9.4	9.8	8.3	8.9	10.2 8.9
All Multiple Source Drugs	6.5	6.0	9.5	7.3	7.1	6.7	4.6 4.4
Multiple Source Originator ¹	11.2	10.0	13.9	11.7	12.1	10.4	10.5 10.1
Multiple Source Non-originator ¹	2.9	9.2	4.4	4.6	2.7	1.4	-0.8 -1.2
Pre-1981 Multiple Source	6.1	5.1	8.7	6.4	6.7	6.7	4.3 5.0
Pre-1981 M. S. Originator ¹	10.8	9.4	13.9	10.7	12.2	10.6	9.4 9.7
Pre-1981 M. S. Non-originator ¹	3.8	9.7	4.2	4.7	2.8	2.7	1.3 1.0
Post-1981 Multiple Source	8.9	11.2	13.9	13.4	10.0	6.8	5.9 1.1
Post-1981 M. S. Originator ¹	12.3	11.9	14.1	14.2	11.8	9.8	13.3 11.1
Post-1981 M. S. Non-originator ¹	-2.8	1.4	8.0	1.6	1.1	-9.9	-12.0 -10.0

¹ Four multisource drug entities (nitroglycerin, theophylline, potassium and quinidine) included in the multisource categories were excluded from the originator and non-originator comparisons because of unavailability of data necessary to identify originators or because the existence of different originators across dosage forms prevented calculation of summative data at the entity level.

Table 8: Simple Average Annual Change in Retail Drug Prices 1982-1988

	Average Annual Percentage Change	Annual Percentage Change						
		82	83	84	85	86	87	88
All Drugs	6.6	9.7	6.0	7.2	5.3	6.3	4.5	7.3
All Single Source Drugs	7.2	10.4	6.7	7.3	6.1	5.0	6.7	7.8
All Multiple Source Drugs	6.5	9.7	5.9	7.2	5.2	6.4	4.2	7.2
Multiple Source Originator ¹	9.3	12.2	9.2	8.3	8.1	8.5	8.2	10.3
Multiple Source Non-originator ¹	5.0	8.4	5.1	8.5	1.6	5.2	1.0	5.2
Pre-1981 Multiple Source	6.2	8.7	5.5	6.7	4.9	5.9	4.3	7.0
Pre-1981 M. S. Originator ¹	8.8	10.9	9.7	7.3	8.0	7.2	8.5	9.7
Pre-1981 M. S. Non-originator ¹	5.3	8.3	5.0	8.7	1.7	6.0	1.7	5.7
Post-1981 Multiple Source	9.1	15.9	8.0	10.3	7.5	9.5	3.6	8.6
Post-1981 M. S. Originator ¹	10.7	16.0	8.0	10.8	8.6	12.0	7.5	12.0
Post-1981 M. S. Non-originator ¹	2.9	10.7	7.6	3.7	-0.4	-1.6	-2.6	3.2

¹ Four multisource drug entities (nitroglycerin, theophylline, potassium and quinidine) included in the multisource categories were excluded from the originator and non-originator comparisons because of unavailability of data necessary to identify originators or because the existence of different originators across dosage forms prevented calculation of summative data at the entity level.

Figures

FIGURE 1: ANNUAL CHANGE IN DRUG PRICE INDICES AT SIX MONTH INTERVALS
COMPARED TO SAME PERIODS IN PREVIOUS YEAR

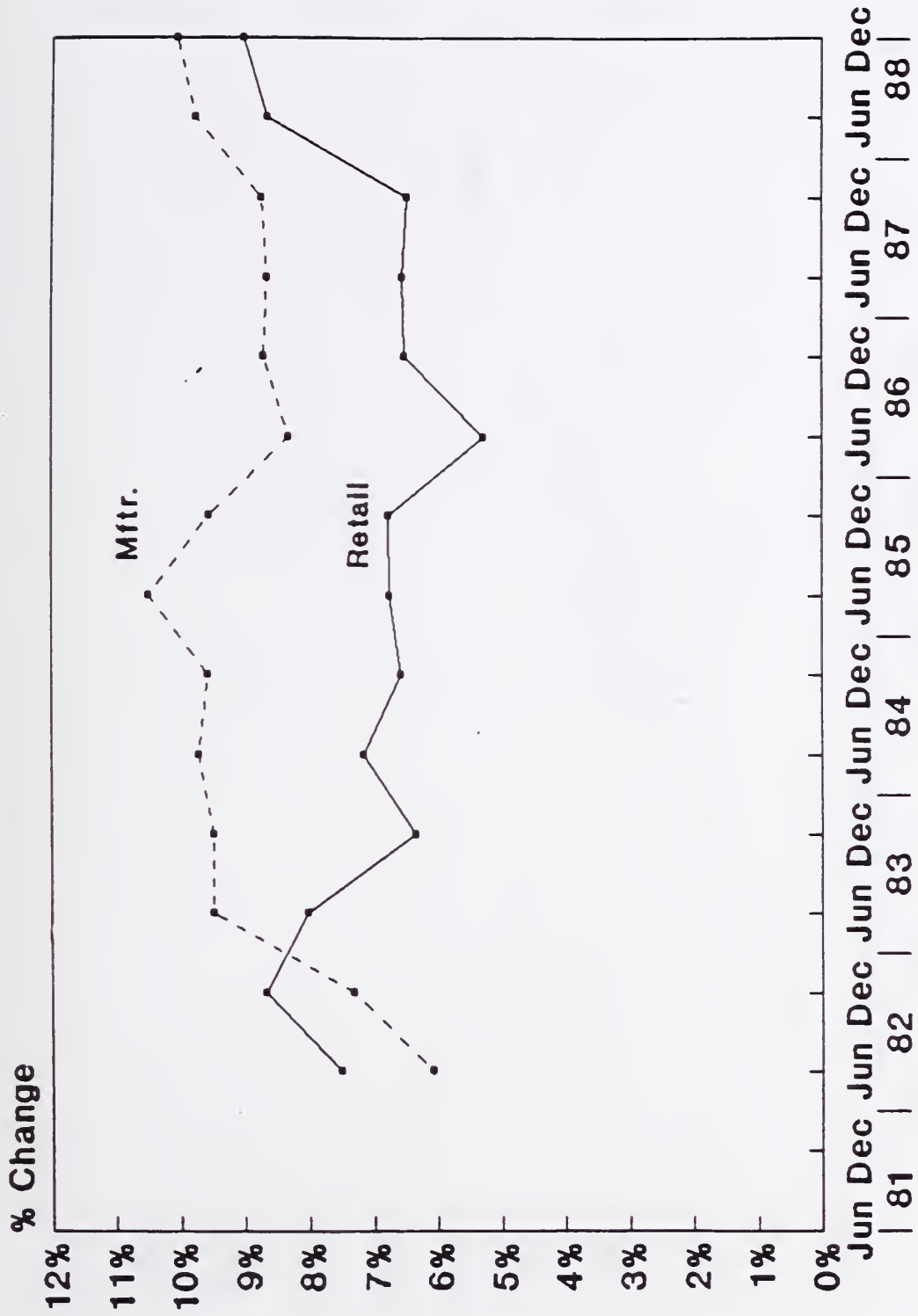


FIGURE 2: TRENDS IN MANUFACTURER AND RETAIL DRUG PRICE INDICES

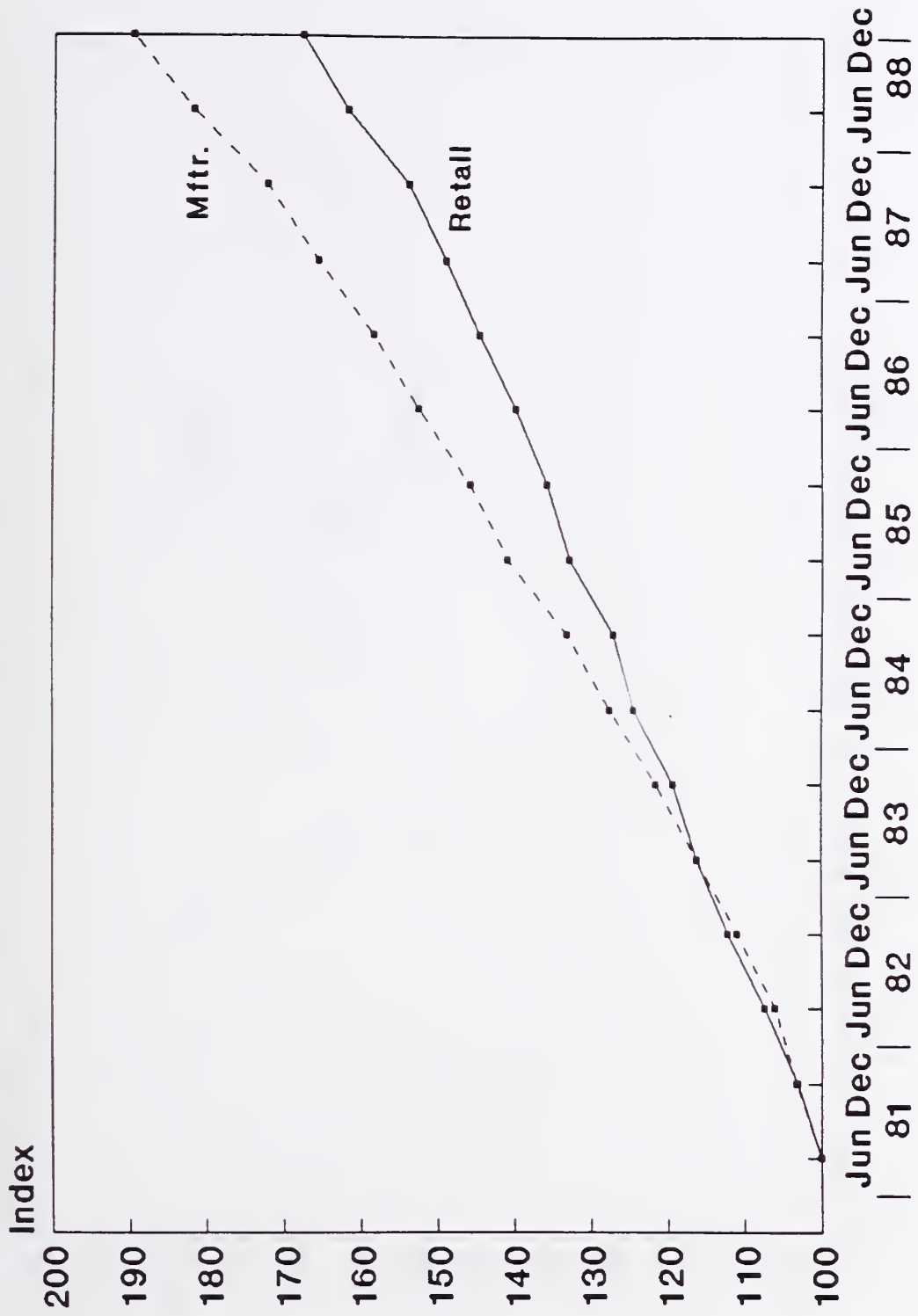


FIGURE 3: ANNUAL CHANGE IN SINGLE SOURCE DRUG PRICE INDICES AT SIX MONTH INTERVALS

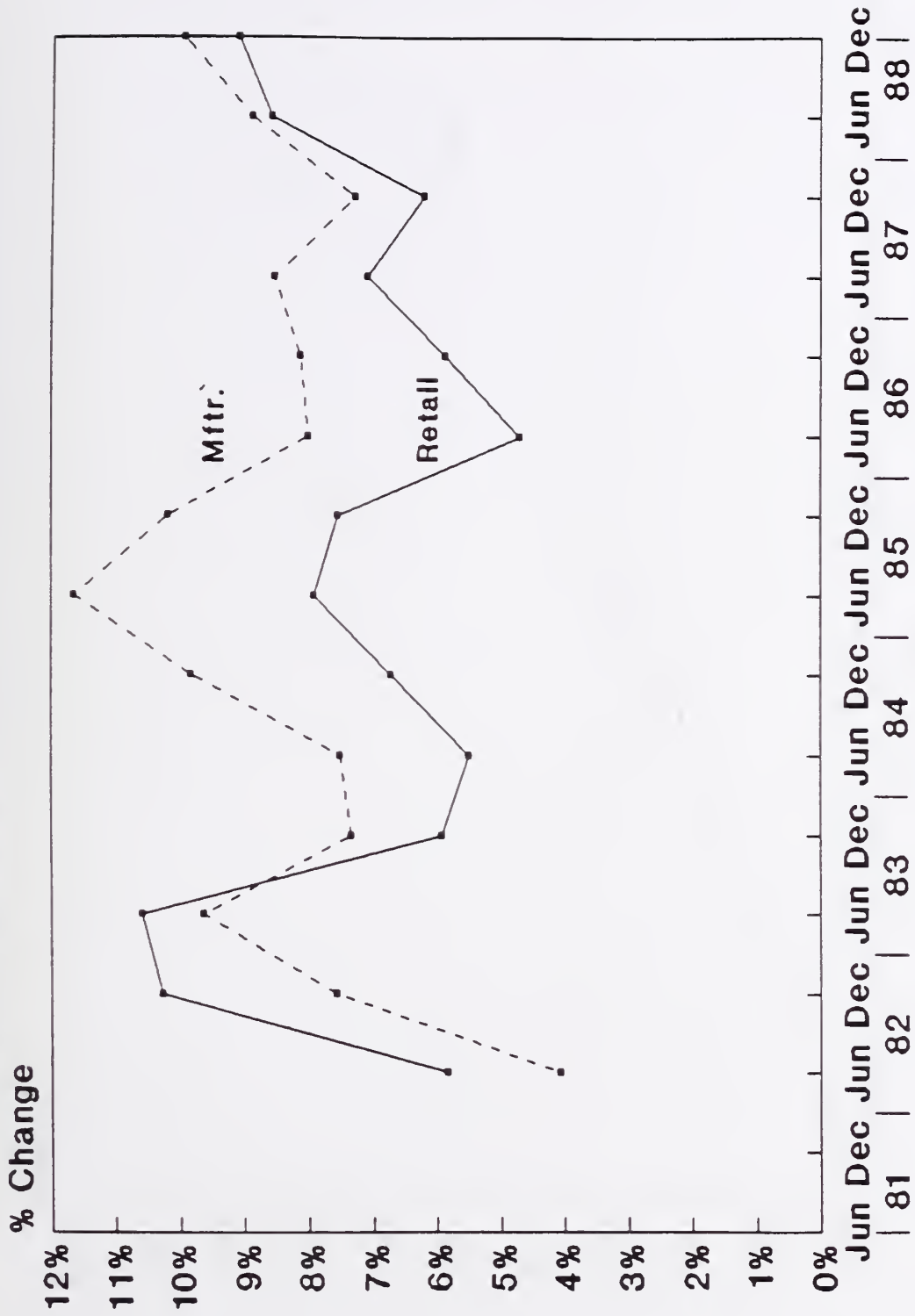


FIGURE 4: TRENDS IN MANUFACTURER AND RETAIL SINGLE SOURCE DRUG PRICE INDICES

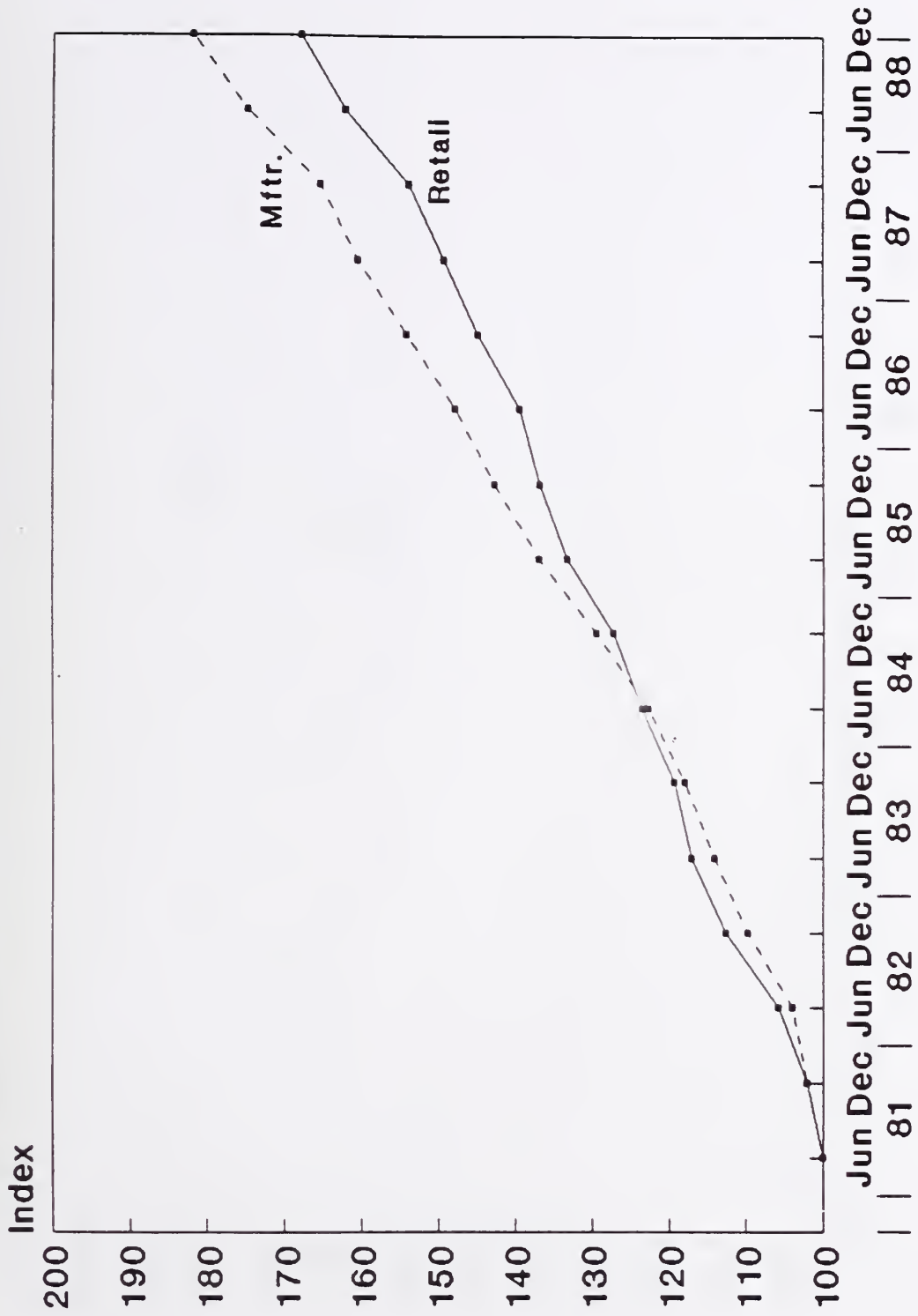
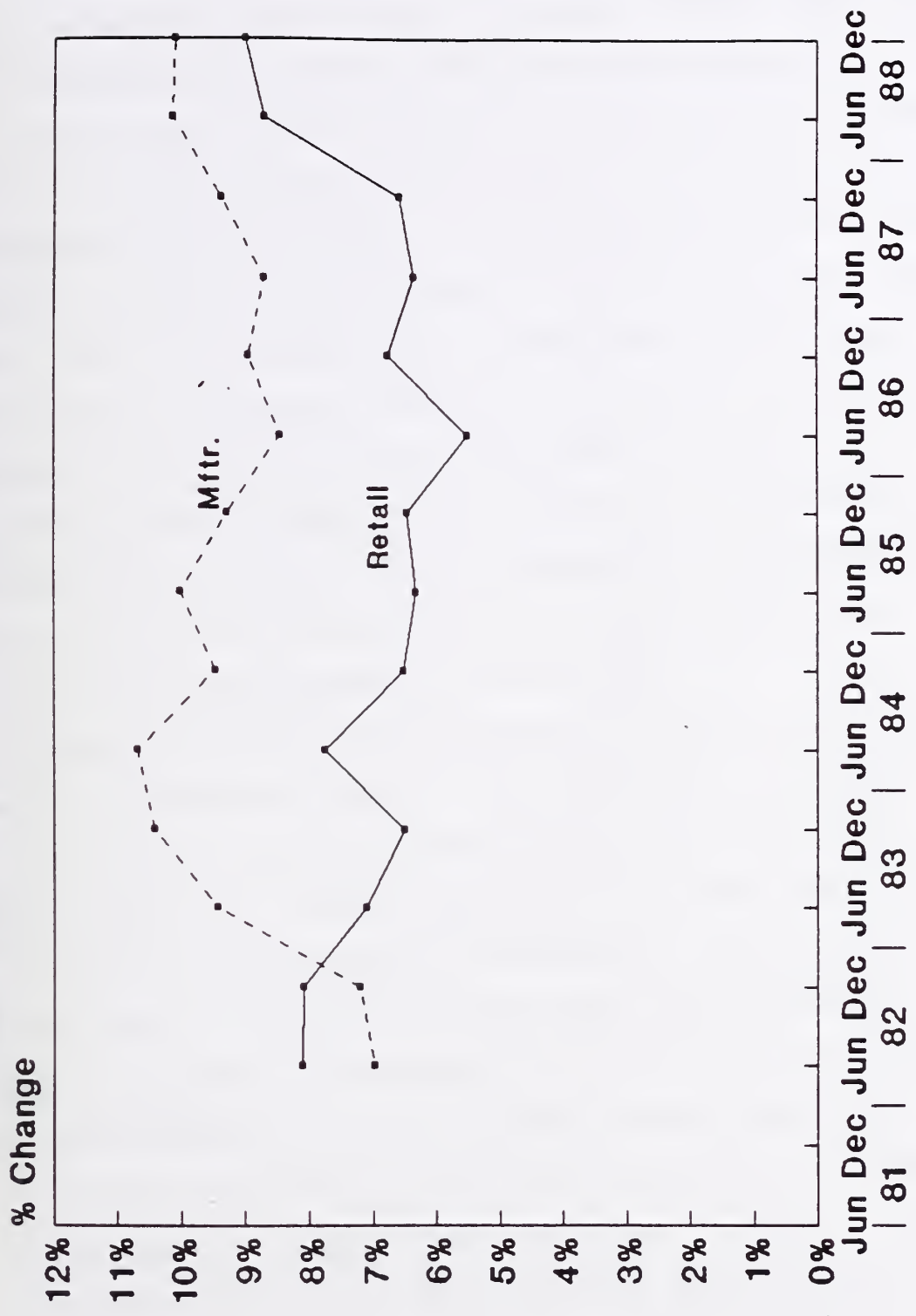


FIGURE 5: ANNUAL CHANGE IN MULTIPLE SOURCE DRUG PRICE INDICES AT SIX MONTH INTERVALS



pharmacies have been found to receive substantially lower prices than community pharmacies in many cases (American Druggist, 1989). Manufacturers comment that some hospitals receive discounts because of their non-profit status. Others suggest that the lower prices are promotional prices to get physicians and patients started on their products in the hospital so that use will continue on an outpatient basis. Hospital buying groups have been able to negotiate or obtain bid prices on both multiple source and single source products. Much of their success comes from the control hospitals have over the prescribing and dispensing of medications in hospitals. Drug formularies established by pharmacy and therapeutics committees of physicians and pharmacists establish a framework for both "generic" and "therapeutic" product interchange within the hospital. By having acceptable substitute products compete in a bid purchasing process, hospitals are able to obtain more competitive pricing from pharmaceutical manufacturers.

Long term care pharmacies and HMO pharmacies are settings that serve patients in a different environment. The transferability of this type of control over the drug distribution process has not been fully tested in the ambulatory environment. Some HMOs, particularly staff model HMOs, have been able to develop and implement generic and therapeutic substitution policies and in turn use this leverage to get better prices from pharmaceutical companies. If an HMO has its own pharmacies, it can operate a bid purchasing program to get competitive pricing. Many HMOs, however, contract with a network or chain of pharmacies and thus never purchase directly, or take title to, drug products prior to dispensing to the patient. In some cases though, the network model HMOs have been able to negotiate "rebates" directly to the HMO based on a contractual agreement to influence the prescribing and dispensing of a certain company's products through the HMO preferred

FIGURE 6: TRENDS IN MANUFACTURER AND RETAIL MULTIPLE SOURCE DRUG PRICE INDICES

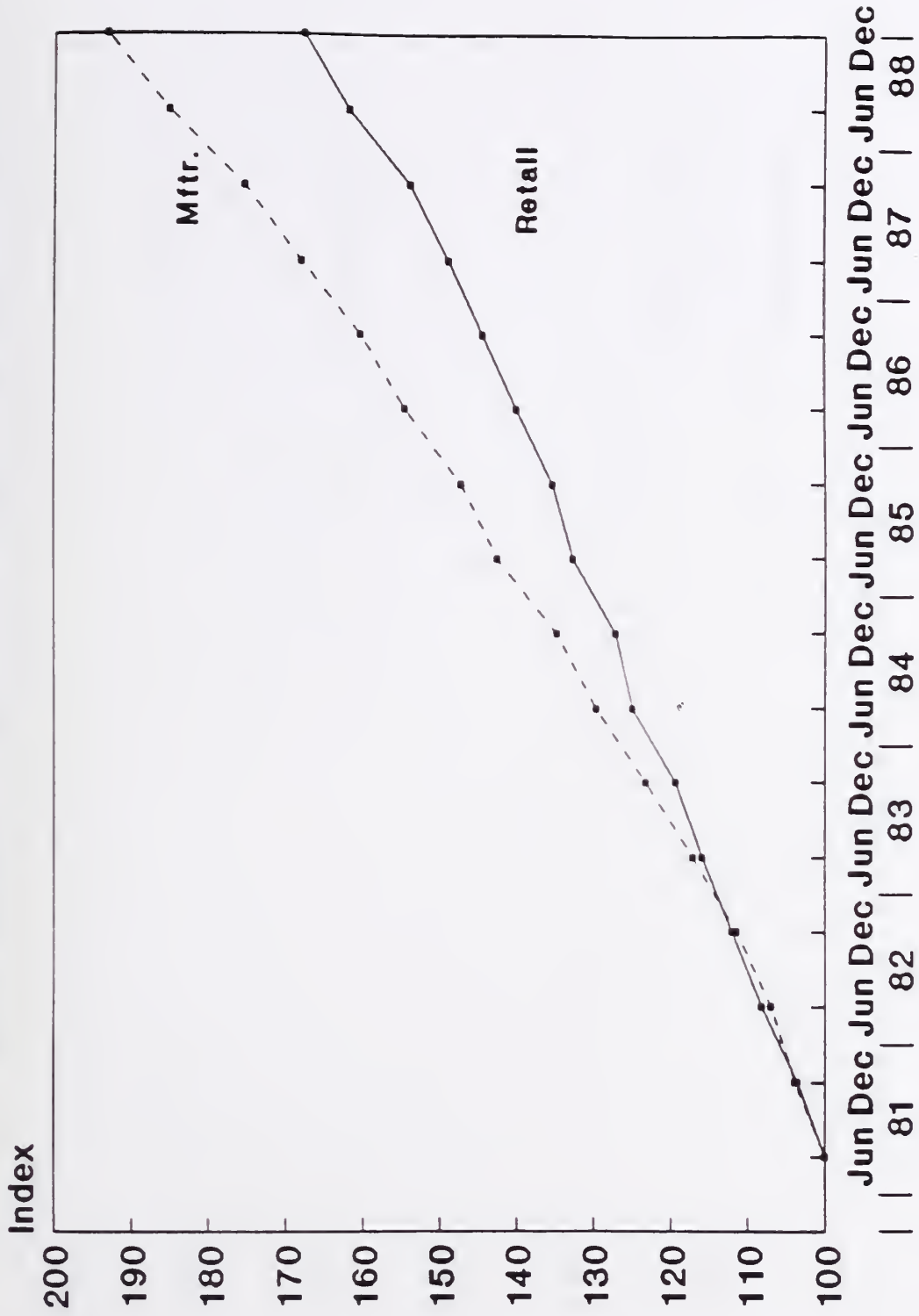


FIGURE 7: TRENDS IN MANUFACTURER AND RETAIL PRICE INDICES FOR ORIGINATOR AND NON-ORIGINATOR MULTIPLE SOURCE DRUGS

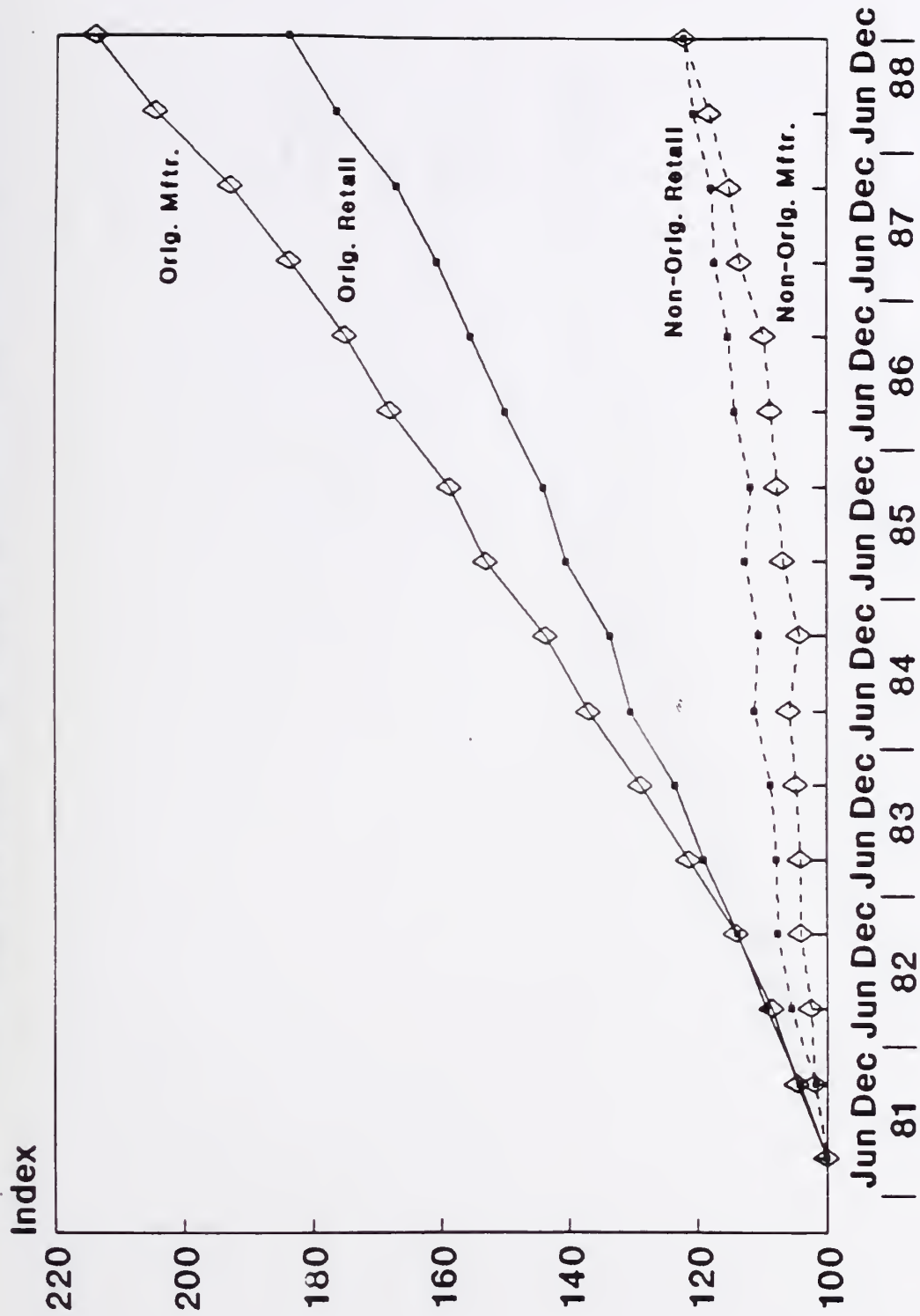


FIGURE 8: TRENDS IN MANUFACTURER AND RETAIL PRICE INDICES FOR PRE-1981 AND POST-1981 MULTIPLE SOURCE DRUGS

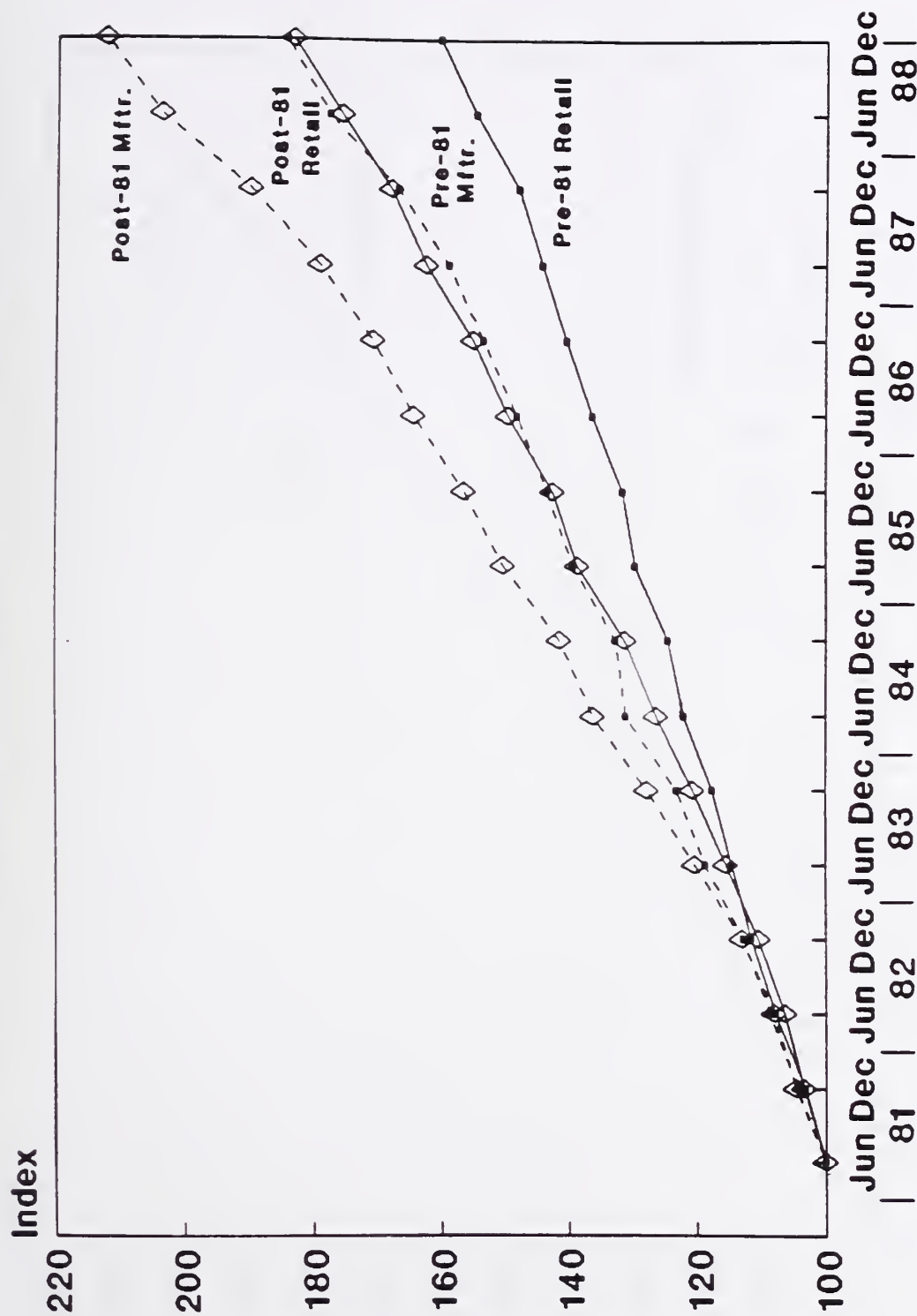


FIGURE 9: TRENDS IN MANUFACTURER AND RETAIL PRICE INDICES FOR ORIGINATOR AND NON-ORIGINATOR PRE-1981 MULTIPLE SOURCE DRUGS

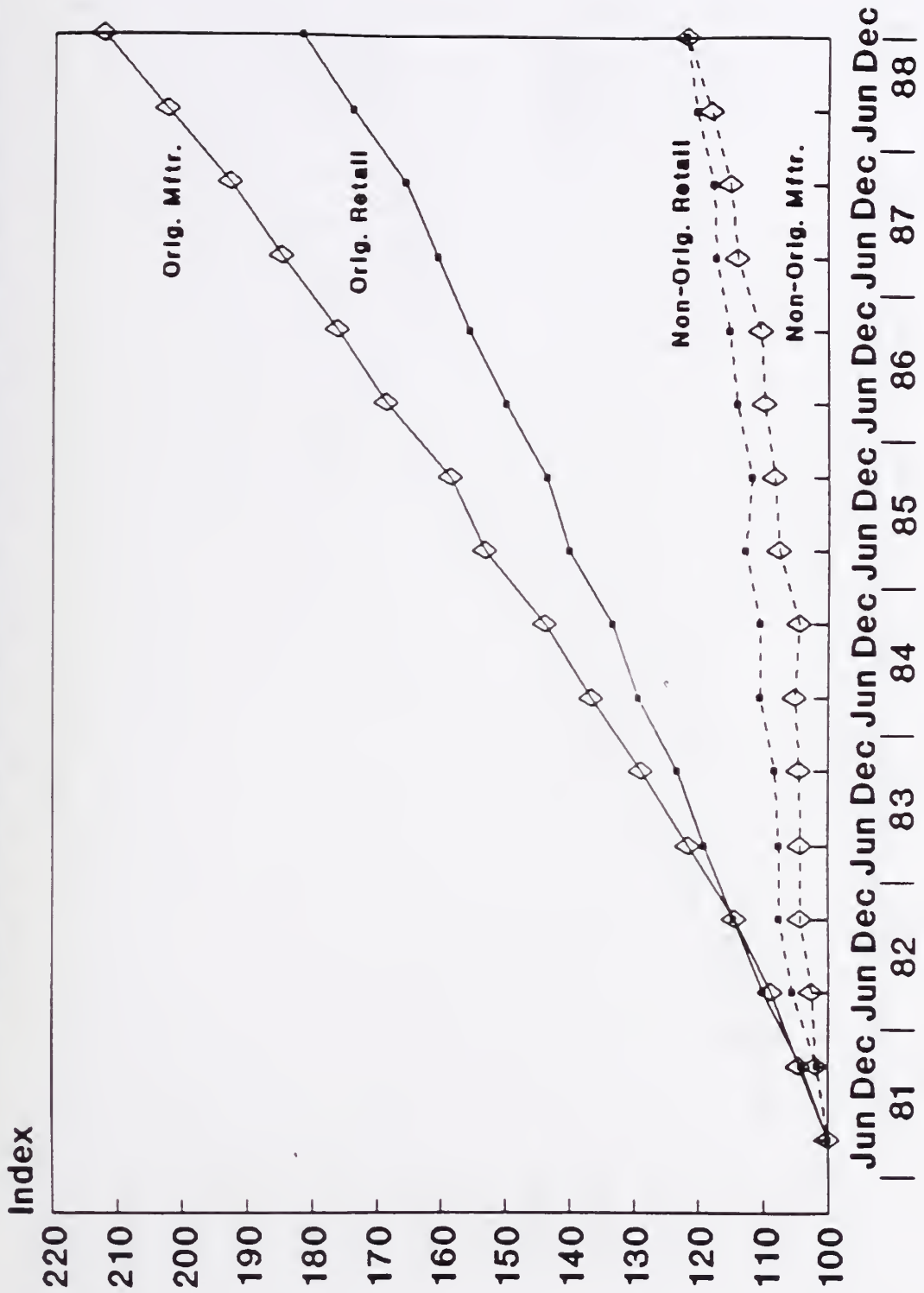


FIGURE 10: TRENDS IN MANUFACTURER AND RETAIL PRICE INDICES FOR ORIGINATOR AND NON-ORIGINATOR POST-1981 MULTIPLE SOURCE DRUGS

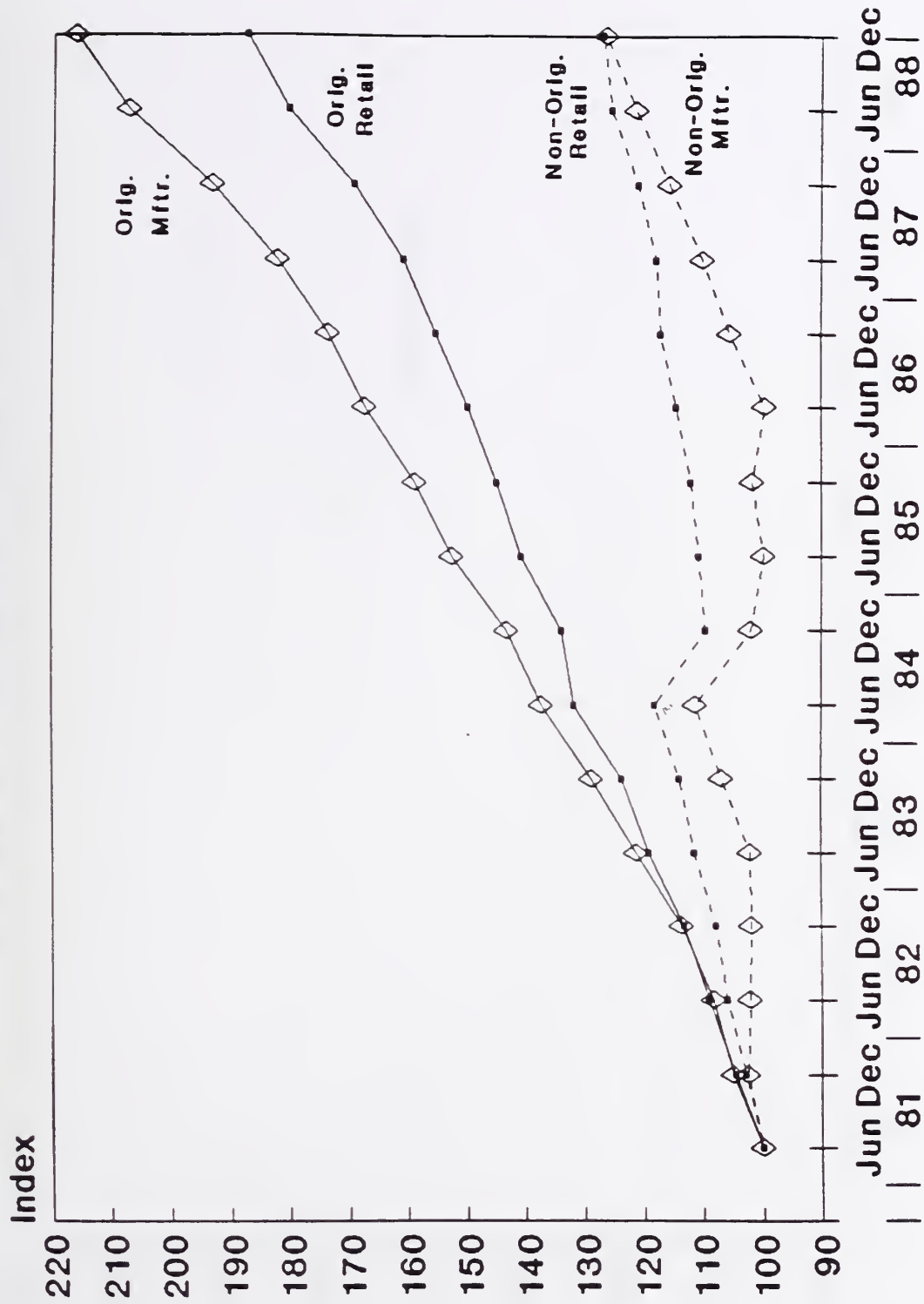


FIGURE 11: NON-ORIGINATOR PRODUCTS' SHARE OF THE MULTIPLE SOURCE DRUG MARKET IN DOLLARS AND UNITS

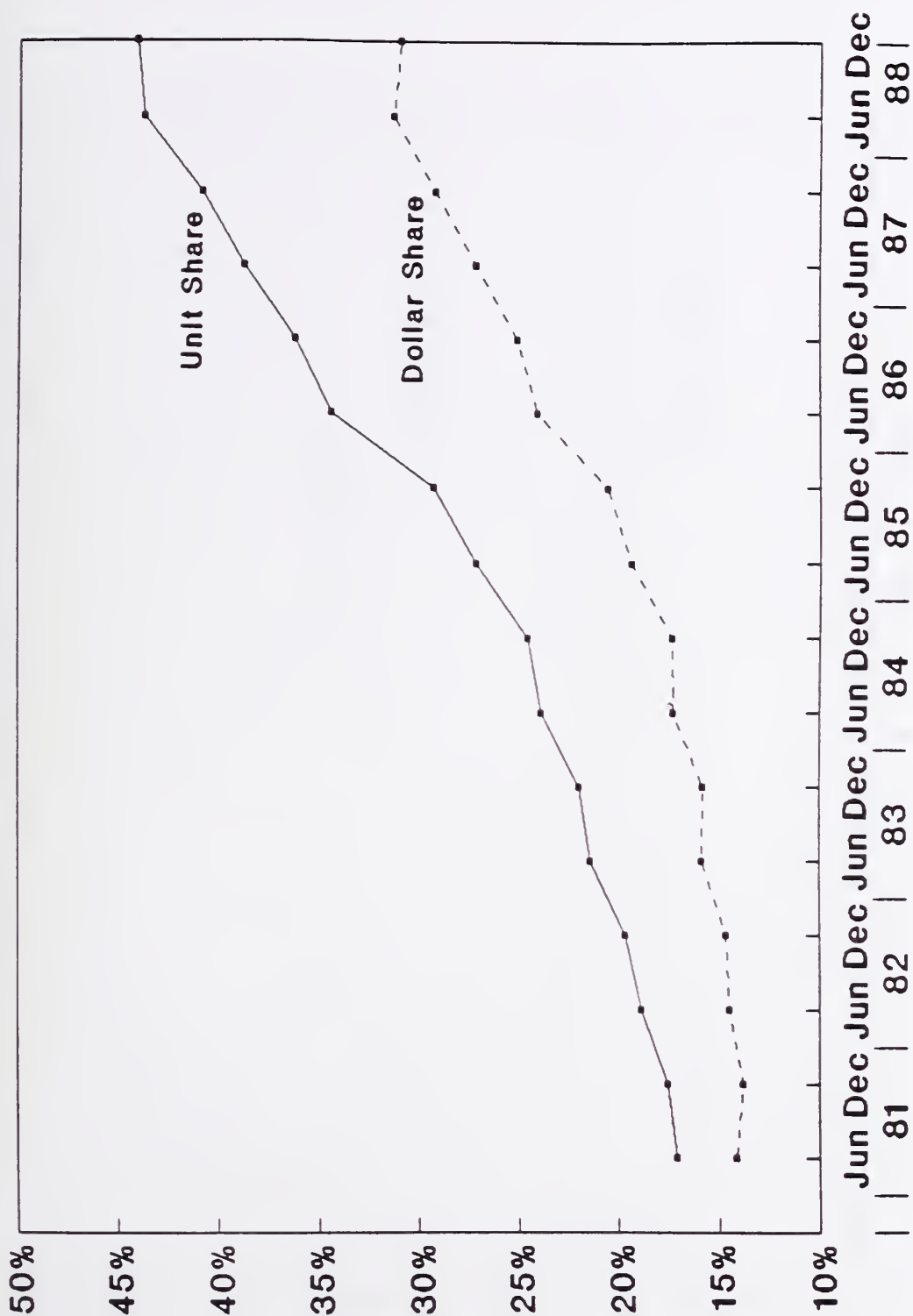
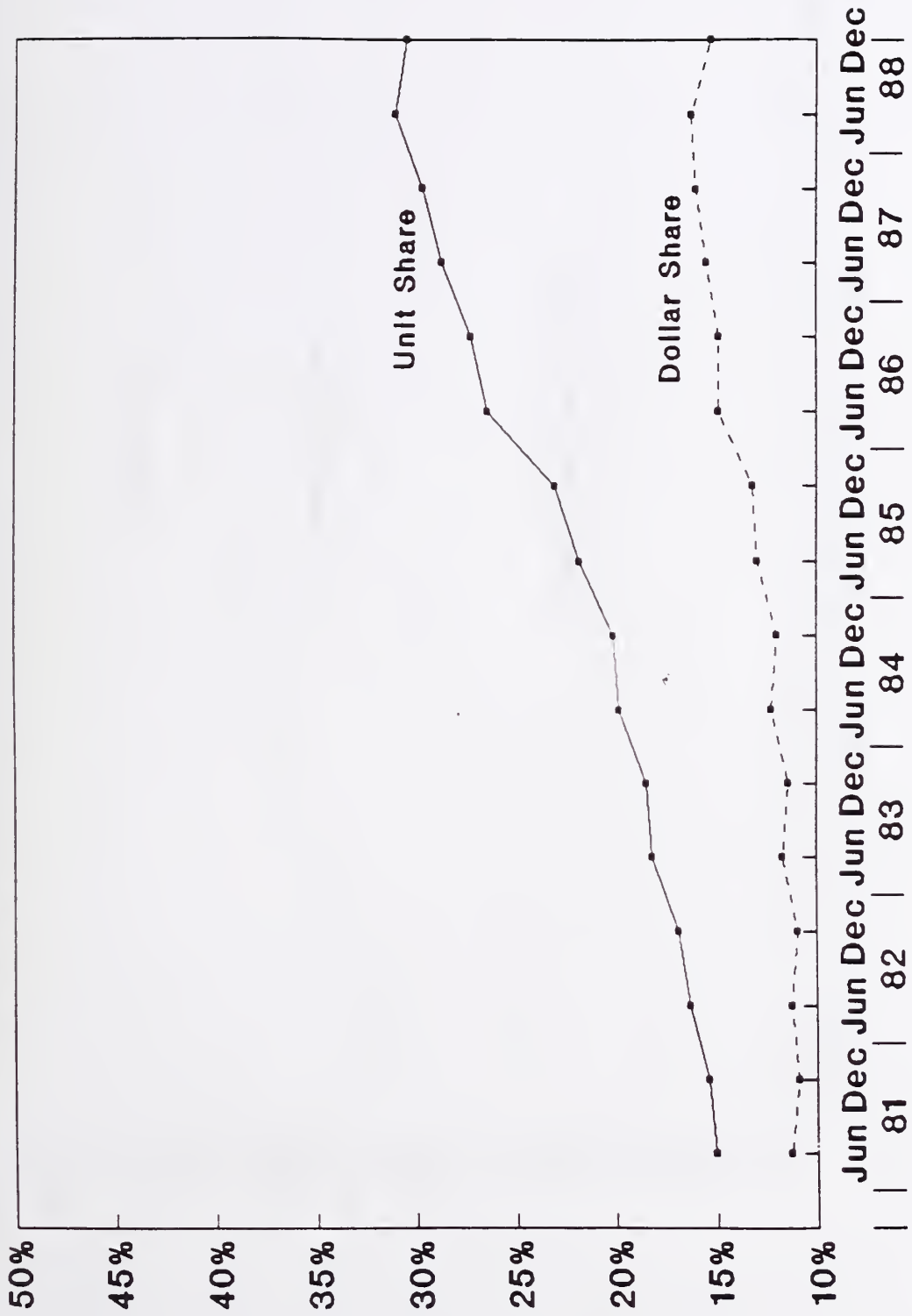


FIGURE 12: NON-ORIGINATOR PRODUCTS' SHARE OF THE TOTAL DRUG MARKET IN DOLLARS AND UNITS



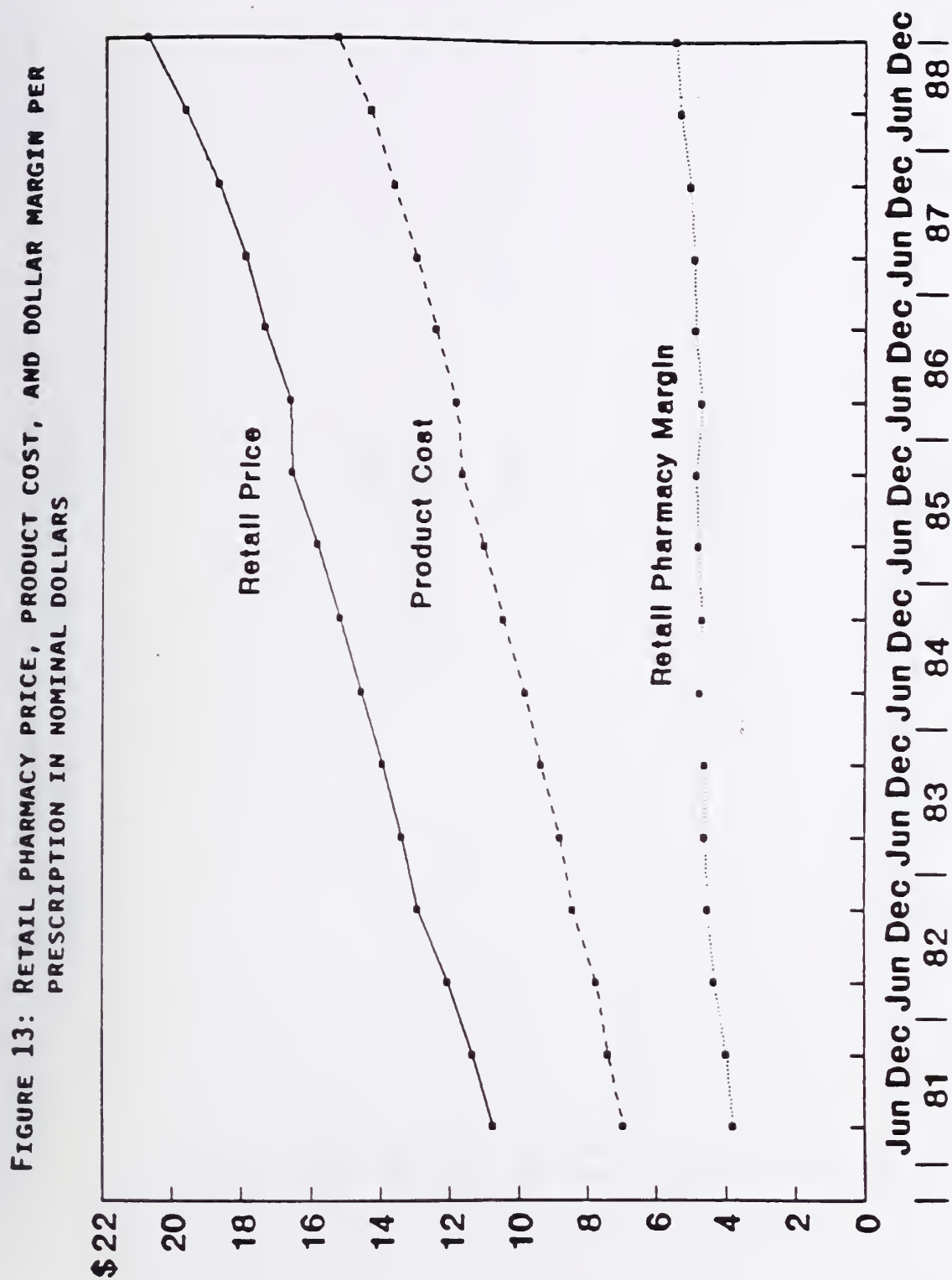


FIGURE 14: RETAIL PHARMACY PRICE, PRODUCT COST, AND DOLLAR MARGIN PER PRESCRIPTION IN CONSTANT DOLLARS

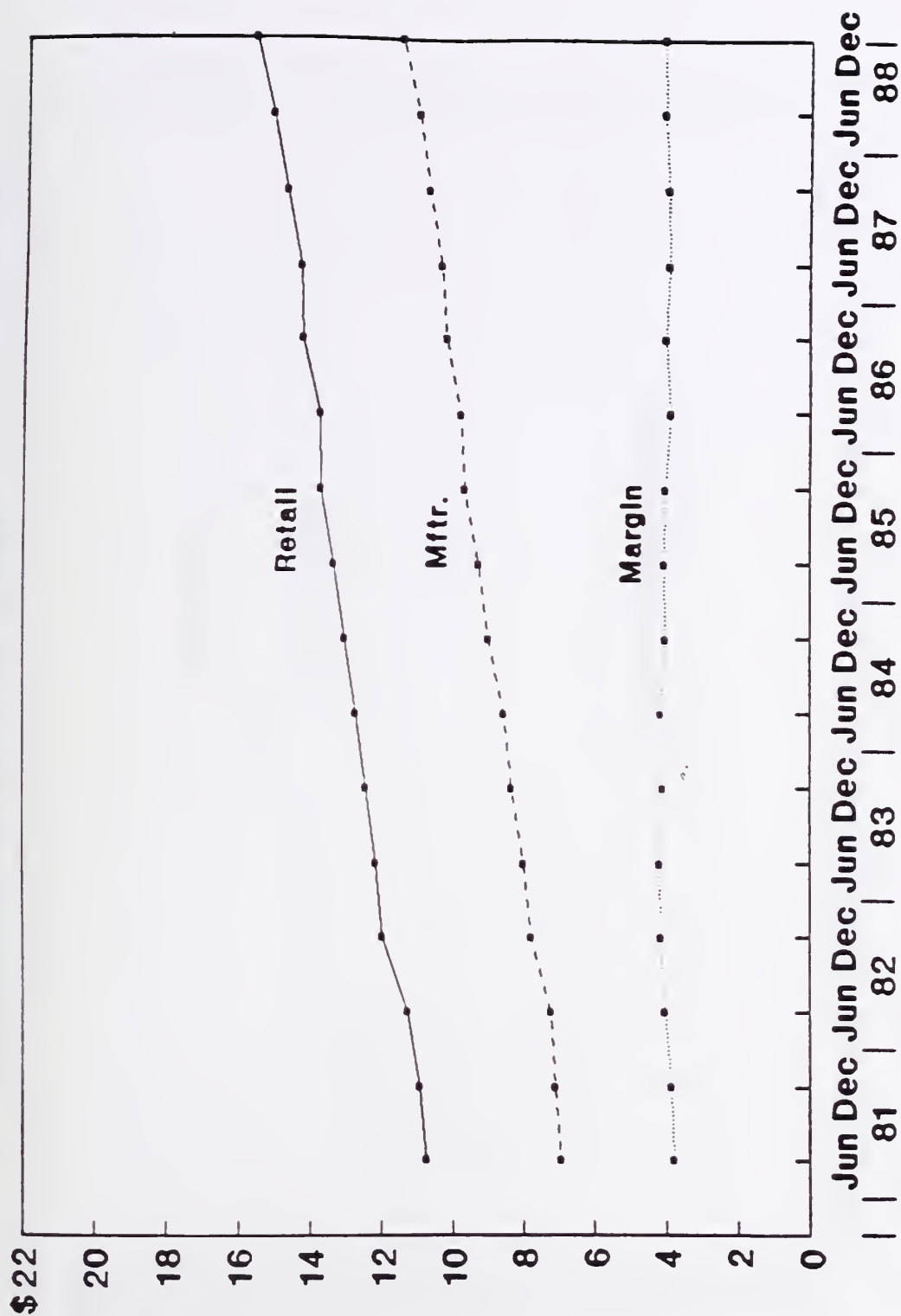


FIGURE 15. RETAIL PHARMACY PRICE, PRODUCT COST, AND DOLLAR MARGIN PER PRESCRIPTION ON SINGLE SOURCE DRUGS

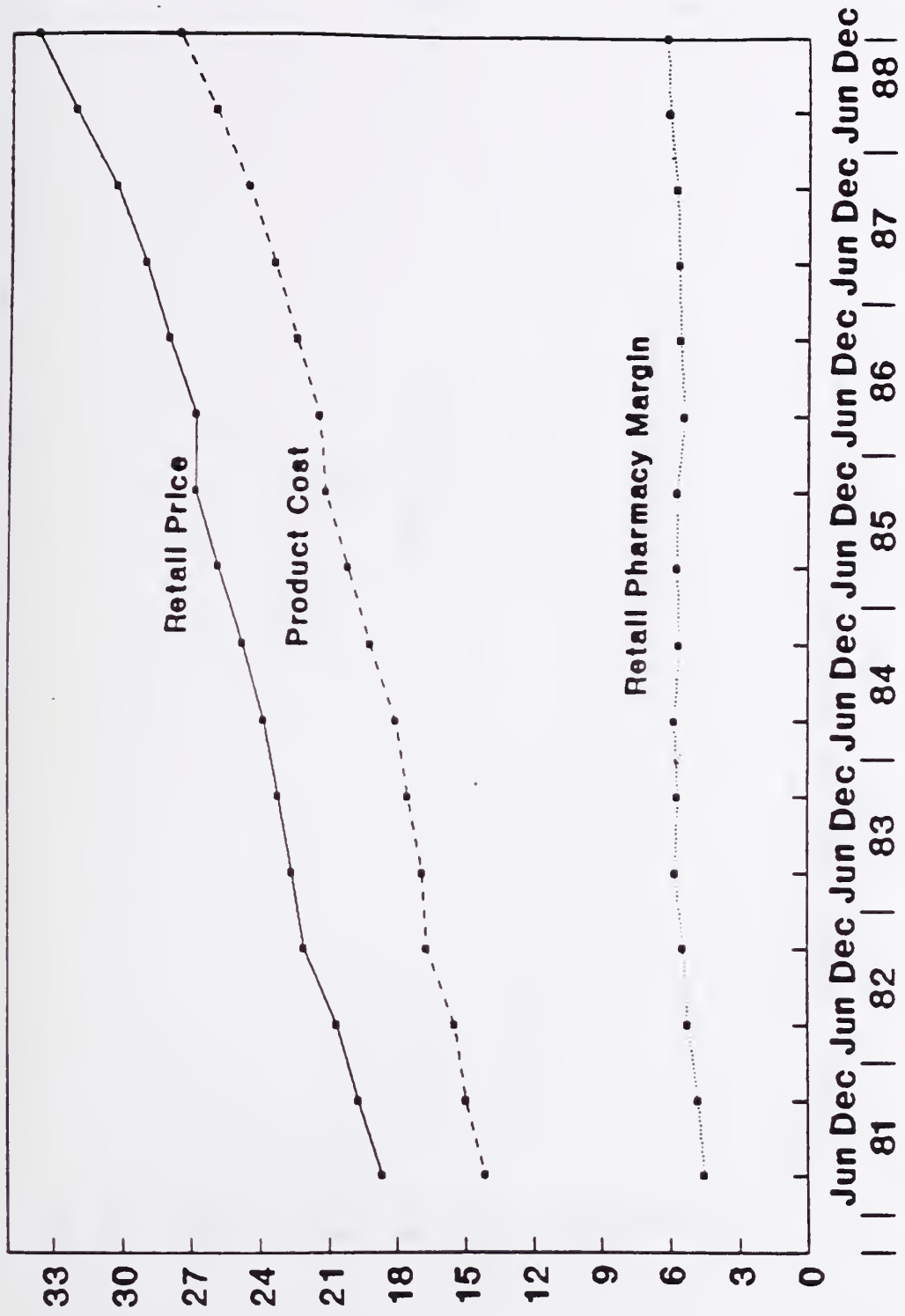


FIGURE 16: RETAIL PHARMACY PRICE, PRODUCT COST, AND DOLLAR MARGIN PER PRESCRIPTION ON MULTIPLE SOURCE DRUGS

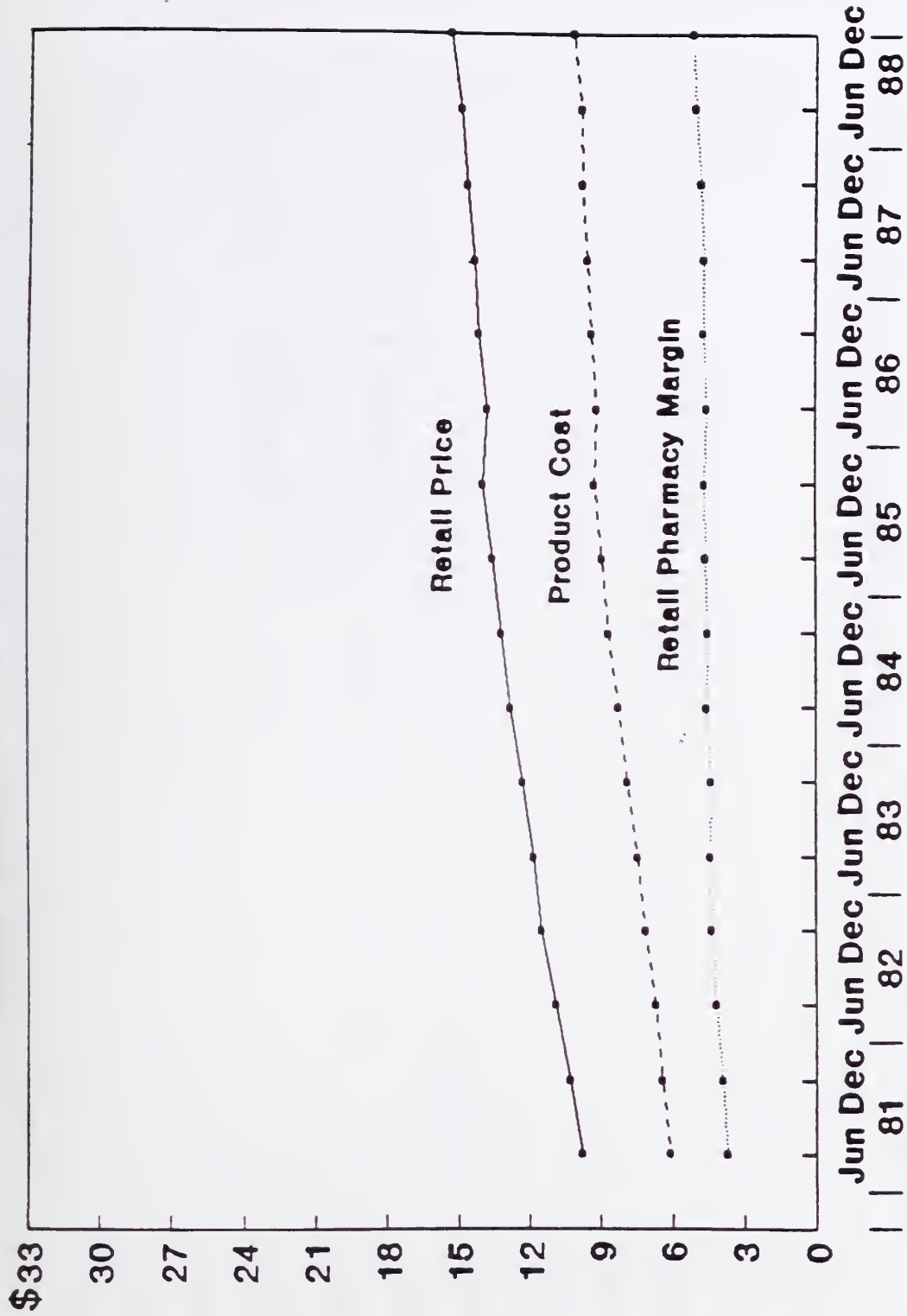


FIGURE 17. RETAIL PHARMACIES' MARGIN PER UNIT ON ALL DRUGS IN NOMINAL AND CONSTANT DOLLARS

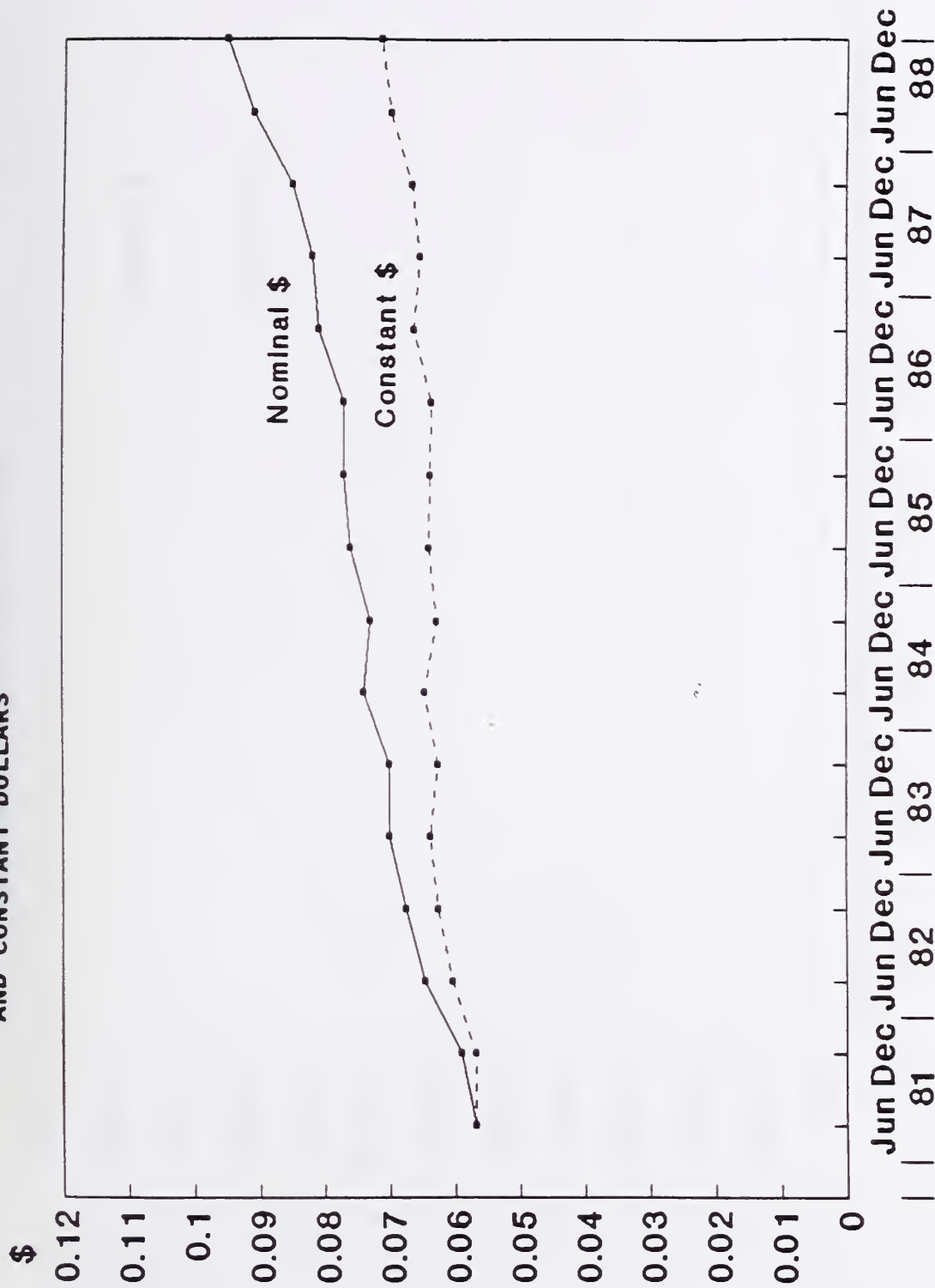


FIGURE 18. RETAIL PHARMACIES' MARGIN PER UNIT ON SINGLE SOURCE DRUGS IN NOMINAL AND CONSTANT DOLLARS

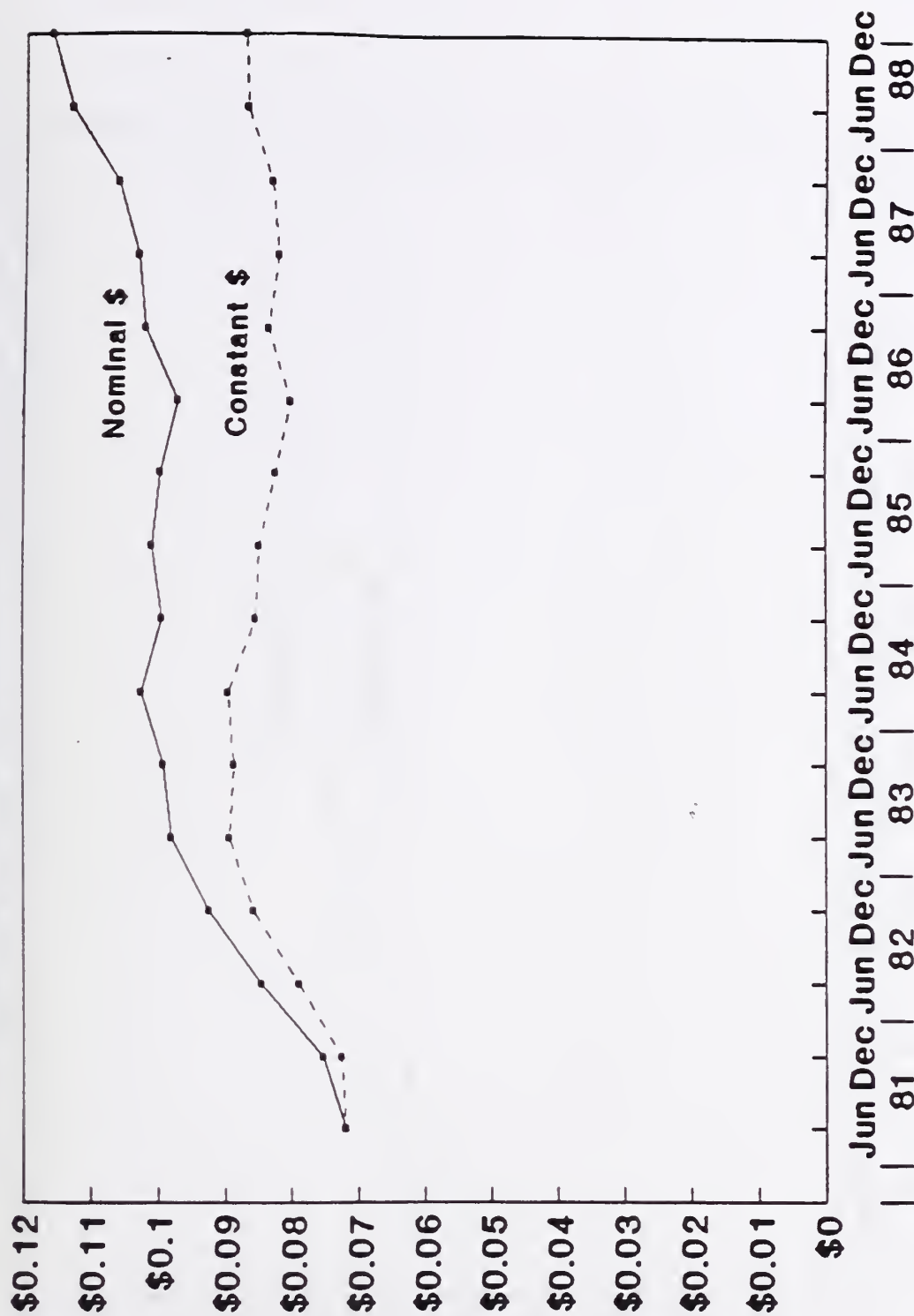


FIGURE 19. RETAIL PHARMACIES' MARGIN PER UNIT ON MULTIPLE SOURCE DRUGS
IN NOMINAL AND CONSTANT DOLLARS

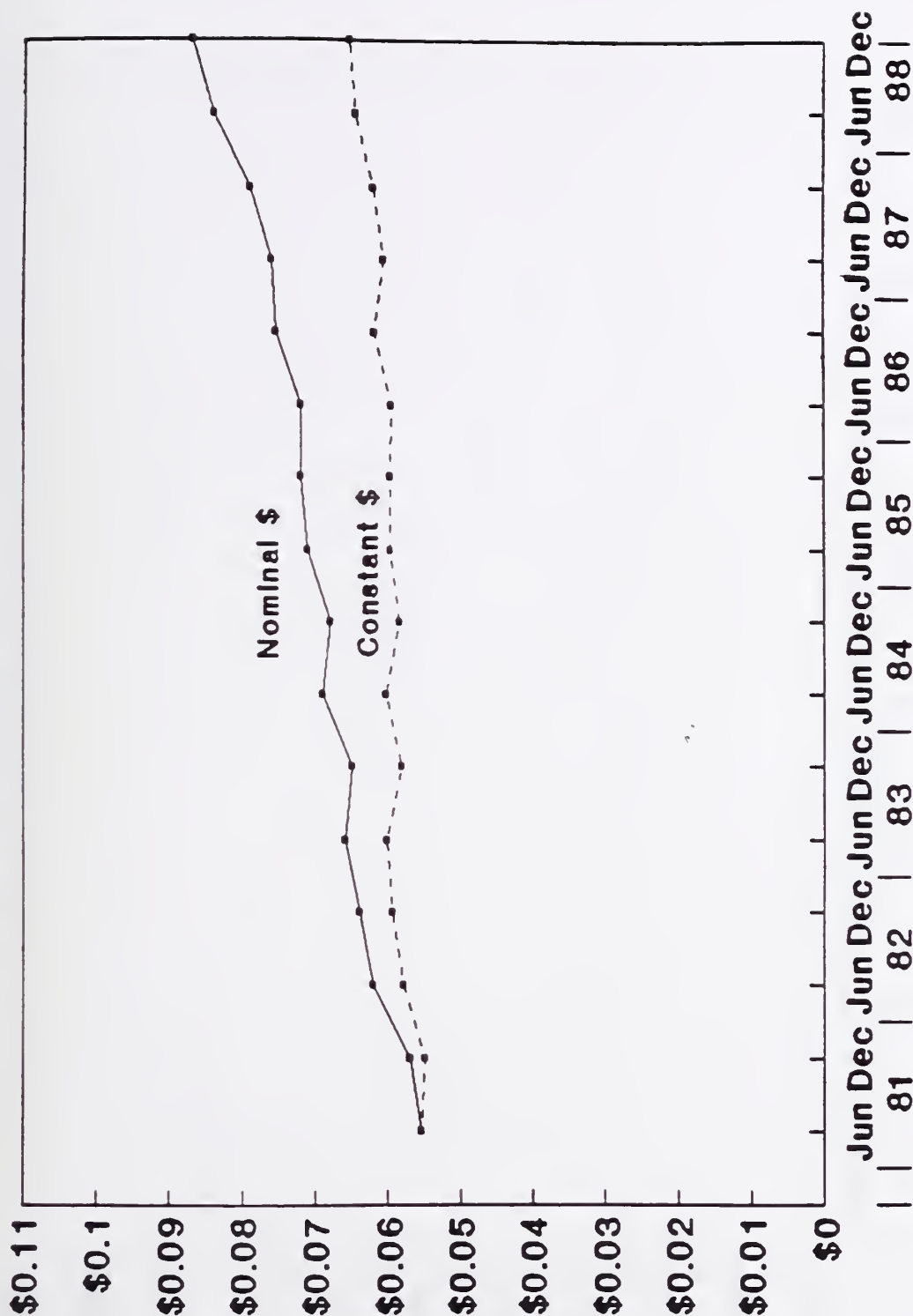


FIGURE 20: TRENDS IN RETAIL PHARMACIES' PERCENTAGE MARGIN ON PRESCRIPTIONS

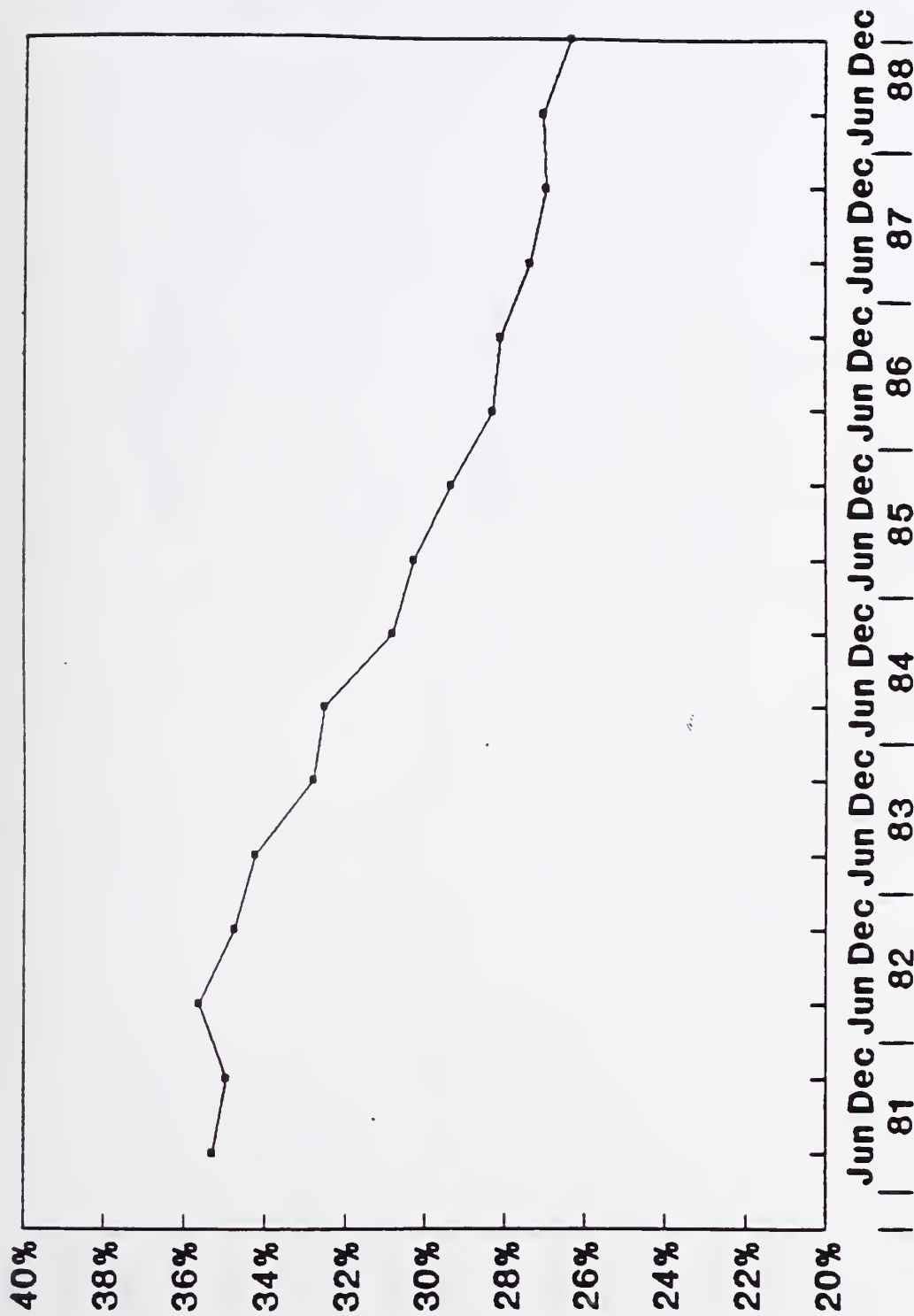


FIGURE 21: TRENDS IN RETAIL PHARMACIES' PERCENTAGE MARGINS ON SINGLE SOURCE AND MULTIPLE SOURCE DRUGS

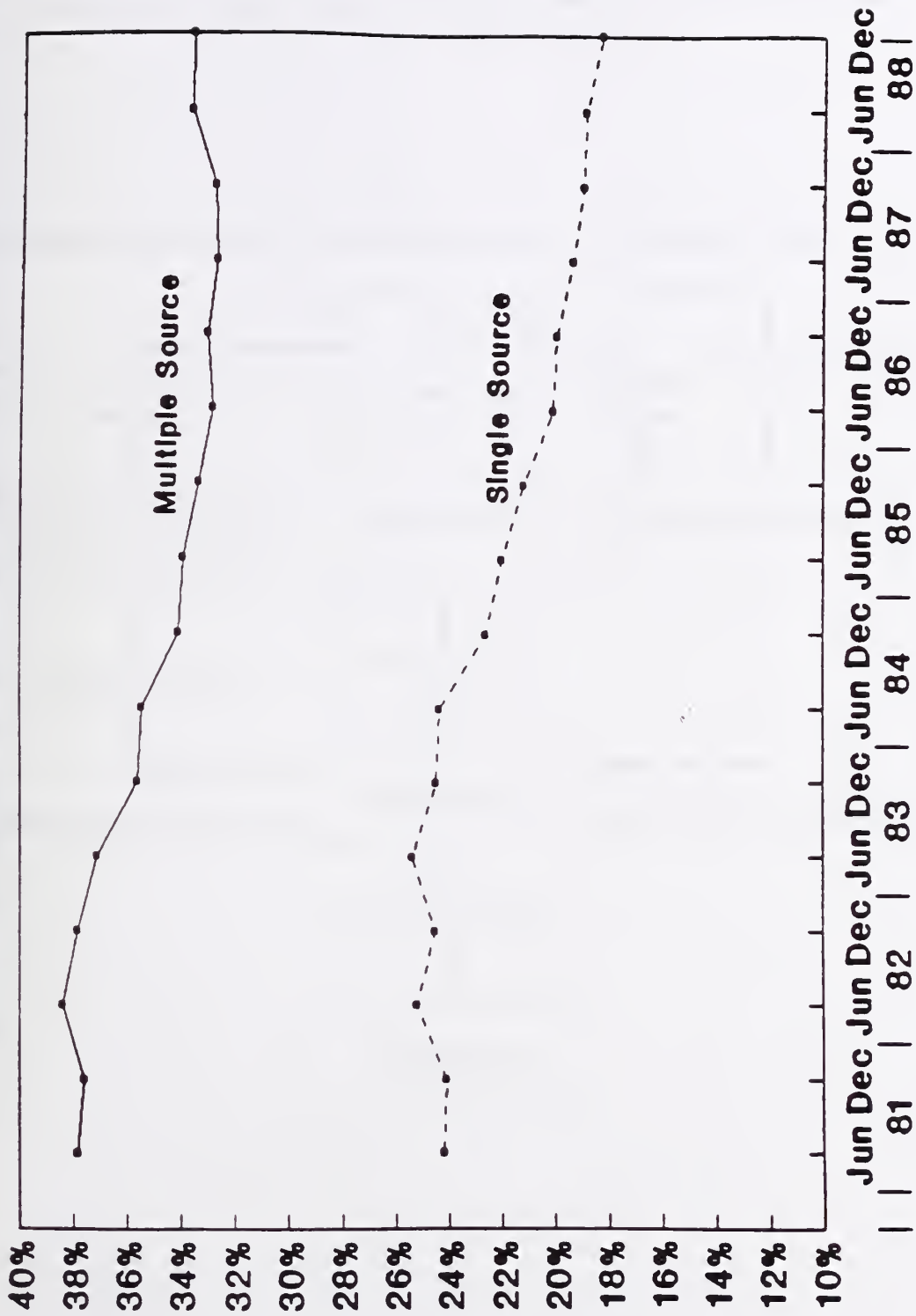


FIGURE 22. TRADITIONAL CHANNELS OF DISTRIBUTION FOR PRESCRIPTION PHARMACEUTICALS

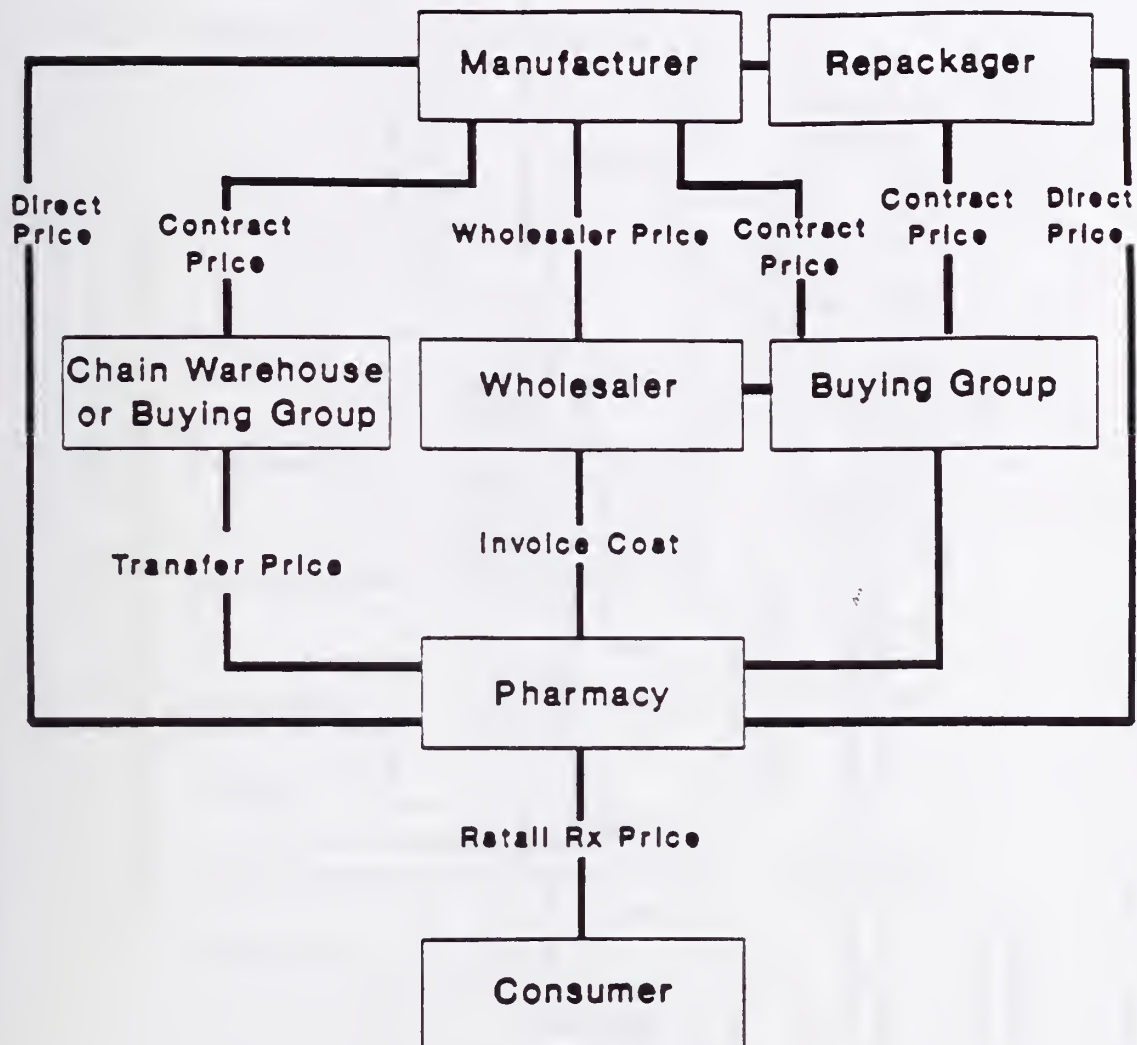
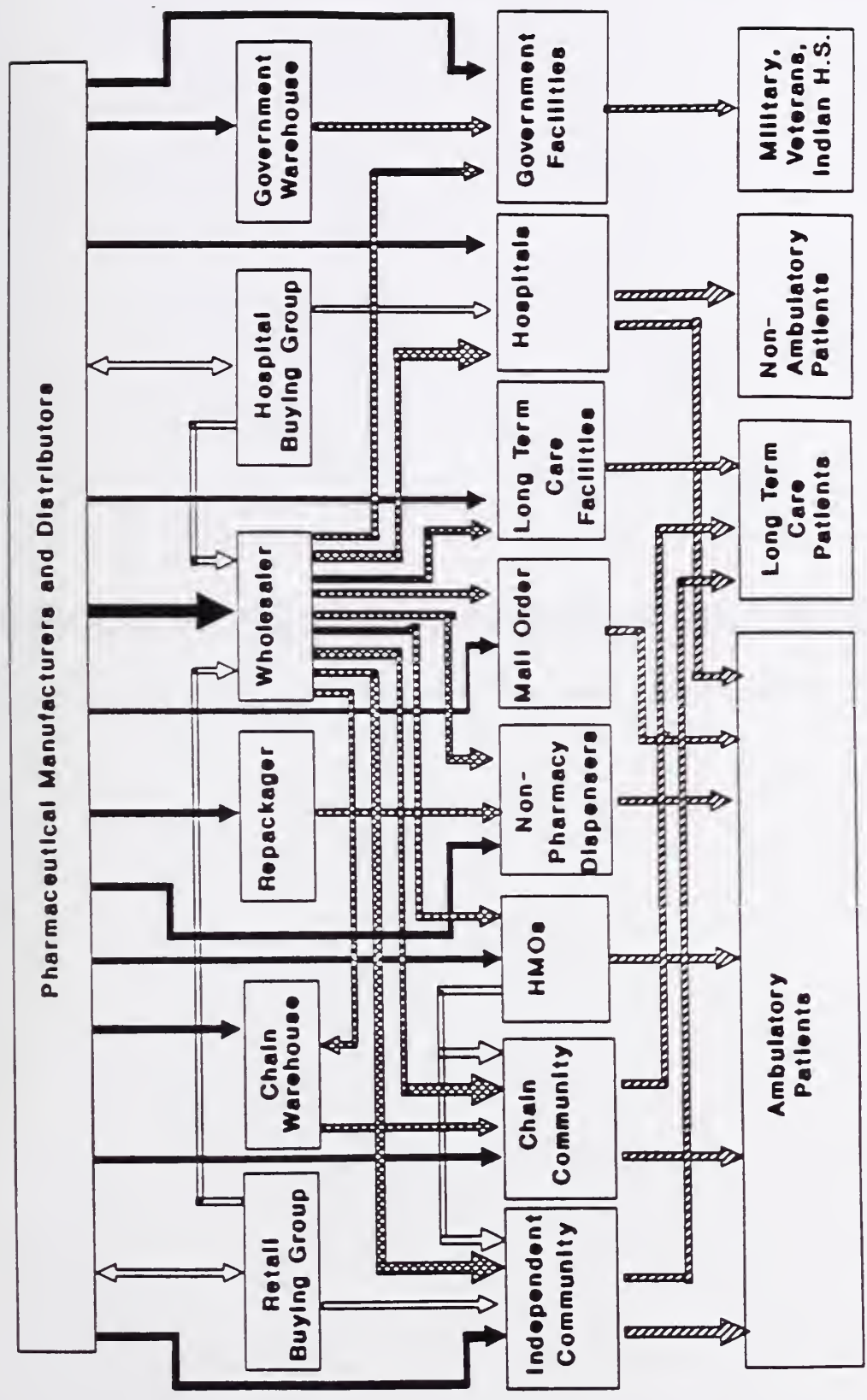


FIGURE 23: ALTERNATIVE CHANNELS OF DISTRIBUTION FOR PRESCRIPTION PHARMACEUTICALS



— Product transfer from manufacturer/distributor level
 Product transfer from wholesale/warehouse level
 // Product transfer from retail level
 — Influence product distribution terms, but not necessarily product flow

Appendix A: Glossary of Terms and Acronyms

Appendix A

Glossary of Terms & Acronyms

Drug entity: any unique chemical or combination of chemicals used in the treatment and diagnosis of disease. Distinctions between drug entities are made solely on the chemical or combination of chemicals included and not the amount of the chemical(s).

Drug product: any unique dosage form and strength of a drug entity marketed by a given manufacturer or distributor. Different dosage forms of the same dosage strength or different dosage strengths of the same dosage form marketed by the same manufacturer are different drug products. The same dosage form and strength of a drug entity marketed by different manufacturers or distributors would also represent different drug products.

Dosage form: the formulation in which a chemical is placed for use by consumers. The most common dosage forms are oral capsules, tablets, or liquids. Other examples are suppositories, sublingual tablets, injectable solutions, nasal sprays.

Dosage strength: the amount of the active chemical included in a given quantity of a dosage form. For example tablets containing 325mg of acetaminophen and those containing 650mg of acetaminophen would represent different dosage strengths. Liquids with different concentrations of a drug would also represent different dosage strengths.

Extended Units: The IMS defined extended dosage unit used as the basis for calculation of unit costs. For solid dosage forms one extended unit is usually equivalent to one capsule or tablet. For liquid dosage forms one extended unit is generally equivalent to one milliliter.

Multiple source drug: A drug that is marketed by two or more manufacturers and/or distributors.

Originator : A drug product marketed by a company that first marketed a drug under an approved New Drug Application. If two or more companies jointly introduced a new drug entity to the market under a licensing agreement, both company's products were considered originators.

Nominal dollars : the dollar cost of an item expressed in terms of actual dollar prices at which the item was sold or purchased during any time period. Since inflation and deflation cause purchasing power or the value of money to vary, nominal dollar prices may be misleading when used to compare values in different periods. Real dollar prices were used to adjust for any such problems.

Non-originators: Any products marketed for a given drug entity other than the originator product or products.

Prescription drug: any drug product that may only be dispensed to consumers on the order of licensed practitioners. Such products are also referred to as "legend" drugs and bear the legend: "Caution: federal law prohibits dispensing without prescription."

Real dollars : the dollar cost of items from which the effect of changes in the purchasing power of the dollar has been removed through expression of dollar figures in terms of dollars of a selected time period. In this report, the Consumer Price Index for All Urban Consumers-All Items was used to adjust nominal dollar figures to real dollars figures in terms of 1981 dollars.

Single source drug: A drug that is marketed by only one manufacturer or distributor.

Acronyms

CPI: Consumer Price Index

DHHS: Department of Health and Human Services

NDTI: National Disease & Therapeutic Index

NPA: National Prescription Audit

PPI: Producer Price Index

SAAC: Simple Average Annual Change

USD: U.S. Pharmaceutical Market--Drugstores

Appendix B

Semi-Annual Drug Price Data

The tables in this appendix present semi-annual price change data. The tables are based on analysis of data from the National Prescription Audit and U.S. Drugstores databases maintained by IMS America, Ltd. All the analysis is based on a subset of drugs accounting for the majority of retail prescription expenditures by the population age 65 and over. This appendix presents data on price changes at the manufacturer and the retail level.

Tables B1 and B2 present data based on analysis of fixed weight Lapeyres price indices developed to allow analysis of trends in drug prices apart from changes in the mix of drugs dispensed. The base year for the indices was 1984. Each index was adjusted to a value of 100 for the January through June period of 1981 to allow easy comparison over time of price changes across drug types and at the manufacturer and retail levels. The tables present the changes in the value of each index from one six month period to the next.

Tables B3 and B4 present data based on analysis of simple average change in drug prices across each six month period. This analysis was designed to reflect the effect of changes in product mix and market share as well as the entry of new products for multiple source drugs.

Table B1 Semi-Annual Change in Manufacturer Price Indices 1982-1988

	Average % Change	Semi-Annual Percentage Change ¹													
		1/82	2/82	1/83	2/83	1/84	2/84	1/85	2/85	1/86	2/86	1/87	2/87	1/88	2/88
Drugs	4.4	2.6	4.5	4.7	4.5	5.0	4.4	5.8	3.5	4.6	3.9	4.6	4.0	5.6	4.3
Single Source Drugs	4.2	1.9	5.5	3.9	3.3	4.1	5.5	5.8	4.1	3.7	4.3	4.1	3.1	5.6	4.1
Multiple Source Drugs	4.5	2.9	4.1	5.1	5.1	5.3	3.9	5.9	3.2	5.1	3.7	4.8	4.4	5.5	4.3
Multiple Source Originator ²	5.2	3.8	5.0	6.4	6.1	6.3	4.9	6.5	3.7	5.9	4.2	4.9	5.0	6.0	4.6
Multiple Source Non-originator ²	1.3	0.6	1.5	-1.2	0.7	1.0	-1.5	2.4	0.8	1.0	1.0	3.3	1.4	2.9	3.4
Pre-1981 Multiple Source	4.2	2.9	3.9	4.4	4.5	4.6	4.0	5.6	2.8	5.0	3.6	4.7	3.5	4.6	4.3
Pre-1981 M. S. Originator ²	5.2	4.2	5.1	6.2	6.0	6.0	5.4	6.5	3.4	6.3	4.6	4.9	4.3	5.1	4.9
Pre-1981 M. S. Non-originator ²	1.3	0.7	1.7	-0.1	0.2	0.6	-0.6	3.0	0.7	1.4	0.5	3.2	0.9	2.6	3.3
Post-1981 Multiple Source	5.2	3.1	4.7	6.4	6.2	6.7	3.8	6.3	4.1	5.1	3.8	5.0	6.0	7.2	4.3
Post-1981 M. S. Originator ²	5.3	3.2	4.9	6.7	6.2	6.8	4.2	6.5	4.1	5.3	3.8	5.0	6.0	7.3	4.3
Post-1981 M. S. Non-originator ²	1.6	-0.2	-0.2	0.1	4.6	4.1	-8.4	-1.9	1.9	-2.2	5.9	4.4	5.0	5.0	4.2

The designations 1/82 and 2/82 represent the first six months and second six months of 1982 respectively. Semi-annual periods in other years have similar designations.

Our multisource drug entities (nitroglycerin, theophylline, potassium and quinidine) included in the multisource categories were excluded from the originator and non-originator comparisons because of unavailability of data necessary to identify originators or because the existence of different originators across dosage forms prevented calculation of unsummative data at the entity level.

Table B2 Semi-Annual Change in Retail Price Indices 1982-1988

	Average % Change	Semi-Annual Percentage Change ¹													
		1/82	2/82	1/83	2/83	1/84	2/84	1/85	2/85	1/86	2/86	1/87	2/87	1/88	2/88
1 Drugs	3.5	4.2	4.3	3.6	2.7	4.3	2.1	4.5	2.2	3.1	3.4	3.1	3.3	5.2	3.7
1 Single Source Drugs	3.6	3.7	6.4	4.0	1.9	3.6	3.1	4.7	2.7	1.9	3.8	3.1	3.0	5.4	3.5
1 Multiple Source Drugs	3.5	4.4	3.6	3.4	3.0	4.6	1.8	4.4	2.0	3.5	3.2	3.1	3.4	5.1	3.7
Multiple Source Originator ²	4.1	5.0	4.0	4.5	3.7	5.6	2.4	5.2	2.6	4.1	3.7	3.4	4.0	5.6	4.3
Multiple Source Non-originator ²	1.3	3.8	1.9	0.3	0.8	2.2	-0.6	1.9	-0.8	2.1	1.1	1.8	0.5	2.4	1.4
Pre-1981 Multiple Source	3.2	4.5	3.5	2.7	2.6	3.8	2.1	4.1	1.5	3.5	3.0	2.9	2.6	4.4	3.7
Pre-1981 M. S. Originator ²	4.1	5.5	4.1	4.0	3.5	4.9	3.1	5.2	2.4	4.5	3.8	3.2	3.1	4.9	4.5
Pre-1981 M. S. Non-originator ²	1.3	3.8	1.9	0.0	0.7	2.0	0.1	2.0	-0.9	2.1	1.0	1.9	0.3	2.2	1.4
Post-1981 Multiple Source	4.2	4.1	3.8	5.1	3.8	6.5	1.2	5.1	2.9	3.4	3.5	3.5	5.1	6.4	3.8
Post-1981 M. S. Originator ²	4.3	4.1	3.9	5.1	3.9	6.6	1.5	5.2	3.0	3.4	3.6	3.6	5.2	6.5	3.9
Post-1981 M. S. Non-originator ²	1.6	3.0	1.8	3.3	2.2	3.6	-7.2	1.2	1.1	2.3	2.3	0.6	2.6	3.9	1.2

The designations 1/82 and 2/82 represent the first six months and second six months of 1982 respectively. Semi-annual periods in other years have similar designations.

Four multisource drug entities (nitroglycerin, theophylline, potassium and quinidine) included in the multisource categories were excluded from the originator and non-originator comparisons because of unavailability of data necessary to identify originators or because the existence of different originators across dosage forms prevented calculation of summative data at the entity level.

Table B3 Semi-Annual Change in Manufacturer Price Change 1982-1988

	Average		Semi-Annual Percentage Change ¹													
	% Change	1/82	2/82	1/83	2/83	1/84	2/84	1/85	2/85	1/86	2/86	1/87	2/87	1/88	2/88	
Drugs	3.3	2.2	3.8	4.8	4.1	4.3	3.0	4.9	2.4	3.6	3.0	3.1	1.8	2.6	3.1	
Single Source Drugs	4.4	3.0	5.4	5.2	3.7	4.8	5.1	5.5	2.4	5.0	3.6	6.7	3.2	5.3	3.4	
Multiple Source Drugs	3.2	2.2	3.6	4.7	4.1	4.2	2.8	4.9	2.4	3.5	2.9	2.7	1.6	2.3	3.0	
Multiple Source Originator ²	5.5	3.5	6.2	7.0	6.4	6.1	5.4	7.5	4.4	5.4	4.7	5.4	4.7	5.4	4.4	
Multiple Source Non-originator ²	1.3	3.9	2.3	3.9	0.3	2.6	0.3	3.3	1.4	0.9	-0.1	0.0	-0.8	-0.5	0.3	
Pre-1981 Multiple Source	3.1	1.9	3.1	4.3	3.8	3.8	2.3	4.6	2.2	3.4	3.0	2.7	1.5	2.5	3.6	
Pre-1981 M. S. Originator ²	5.3	3.4	6.0	6.9	6.5	5.6	5.0	7.6	4.5	5.3	5.0	5.1	4.1	5.2	4.4	
Post-1981 M. S. Non-originator ²	1.7	4.0	2.4	3.9	0.1	2.6	0.4	3.6	1.3	1.5	0.7	1.4	0.1	0.7	1.8	
Post-1981 Multiple Source	4.2	3.9	6.7	7.0	6.3	6.9	6.0	6.4	3.3	3.9	2.4	2.7	2.2	1.2	-0.7	
Post-1981 M. S. Originator ²	5.9	4.0	6.8	7.3	6.3	7.2	6.4	7.2	4.3	5.5	3.9	6.3	6.3	6.2	4.6	
Post-1981 M. S. Non-originator ²	-1.5	1.8	1.7	4.0	4.0	2.4	-2.9	-0.4	2.7	-4.3	-5.7	-7.2	-5.5	-5.7	-6.1	

The designations 1/82 and 2/82 represent the first six months and second six months of 1982 respectively. Semi-annual periods in other years have similar designations.

Our multisource drug entities (nitroglycerin, theophylline, potassium and quinidine) included in the multisource categories were excluded from the originator and non-originator comparisons because of unavailability of data necessary to identify originators or because the existence of different originators across dosage forms prevented calculation of summative data at the entity level.

Table B4 Semi-Annual Change in Retail Price Change 1982-1988

	Average % Change	Semi-Annual Percentage Change ¹													
		1/82	2/82	1/83	2/83	1/84	2/84	1/85	2/85	1/86	2/86	1/87	2/87	1/88	2/88
1 Drugs	3.4	4.6	5.2	4.1	2.0	4.5	2.7	4.0	1.4	3.5	3.3	2.0	2.5	4.4	2.9
1 Single Source Drugs	3.6	5.1	6.1	5.1	1.6	4.1	2.9	4.2	2.6	1.8	2.9	3.2	1.9	4.7	4.8
1 Multiple Source Drugs	3.3	4.5	5.1	4.0	2.0	4.5	2.6	3.9	1.2	3.7	3.4	1.9	2.6	4.4	2.7
Multiple Source Originator ²	4.6	5.8	5.6	5.6	4.0	5.8	2.7	4.9	3.0	5.2	3.6	3.0	5.4	6.2	3.8
Multiple Source Non-originator ²	3.0	4.9	4.6	4.4	0.7	3.8	3.6	3.5	-1.1	3.3	3.2	0.4	4.4	3.3	2.5
Pre-1981 Multiple Source	3.2	4.2	4.8	4.2	1.5	4.2	2.5	3.7	1.2	3.7	3.0	2.1	2.6	3.8	2.8
Pre-1981 M. S. Originator ²	4.4	5.4	5.0	6.6	3.5	5.4	2.3	4.6	3.4	5.2	2.2	3.2	5.7	5.3	3.4
Pre-1981 M. S. Non-originator ²	3.2	4.9	4.5	4.4	0.5	3.8	3.9	3.7	-1.1	4.0	3.5	0.9	5.3	3.0	3.2
Post-1981 Multiple Source	4.4	6.8	7.4	2.9	5.2	6.3	3.3	5.1	1.4	3.6	5.6	0.6	2.8	8.3	2.0
Post-1981 M. S. Originator ²	5.2	7.0	7.1	2.8	5.4	6.7	3.6	5.5	2.0	5.3	7.1	2.4	4.8	8.6	4.7
Post-1981 M. S. Non-originator ²	1.3	4.9	7.1	4.3	3.3	3.6	-3.2	0.2	-1.4	-3.0	0.9	-2.0	-0.4	4.6	-0.7

The designations 1/82 and 2/82 represent the first six months and second six months of 1982 respectively. Semi-annual periods in other years have similar designations.

Four multisource drug entities (nitroglycerin, theophylline, potassium and quinidine) included in the multisource categories were excluded from the originator and non-originator comparisons because of unavailability of data necessary to identify originators or because the existence of different originators across dosage forms prevented calculation of summative data at the entity level.

Appendix C: Semi-Annual Change in Drug Price Indices

FIGURE C1: SEMI-ANNUAL CHANGE IN MANUFACTURER AND RETAIL DRUG PRICE INDICES

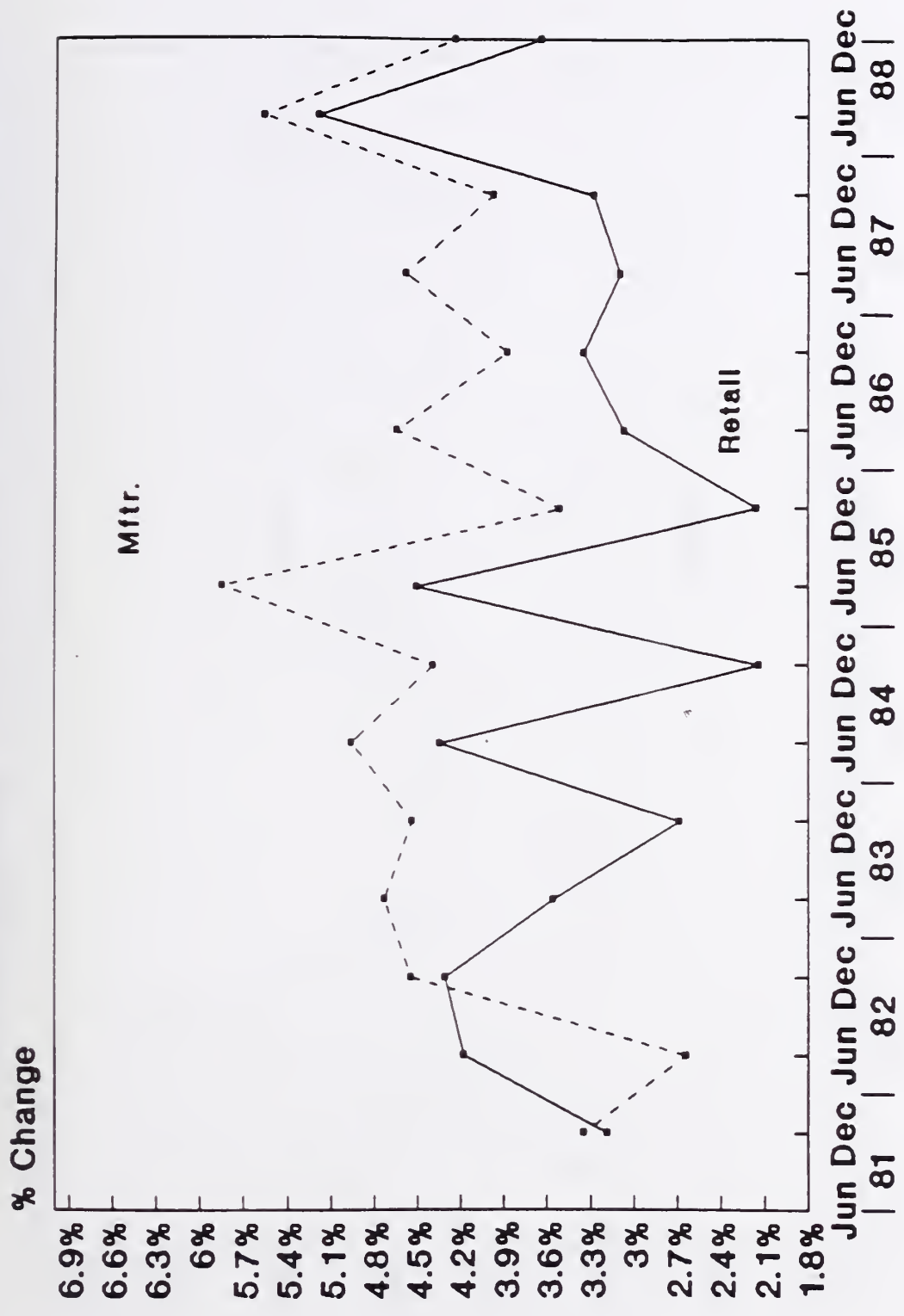


FIGURE C2: SEMI-ANNUAL CHANGE IN MANUFACTURER AND RETAIL SINGLE SOURCE
DRUG PRICE INDICES

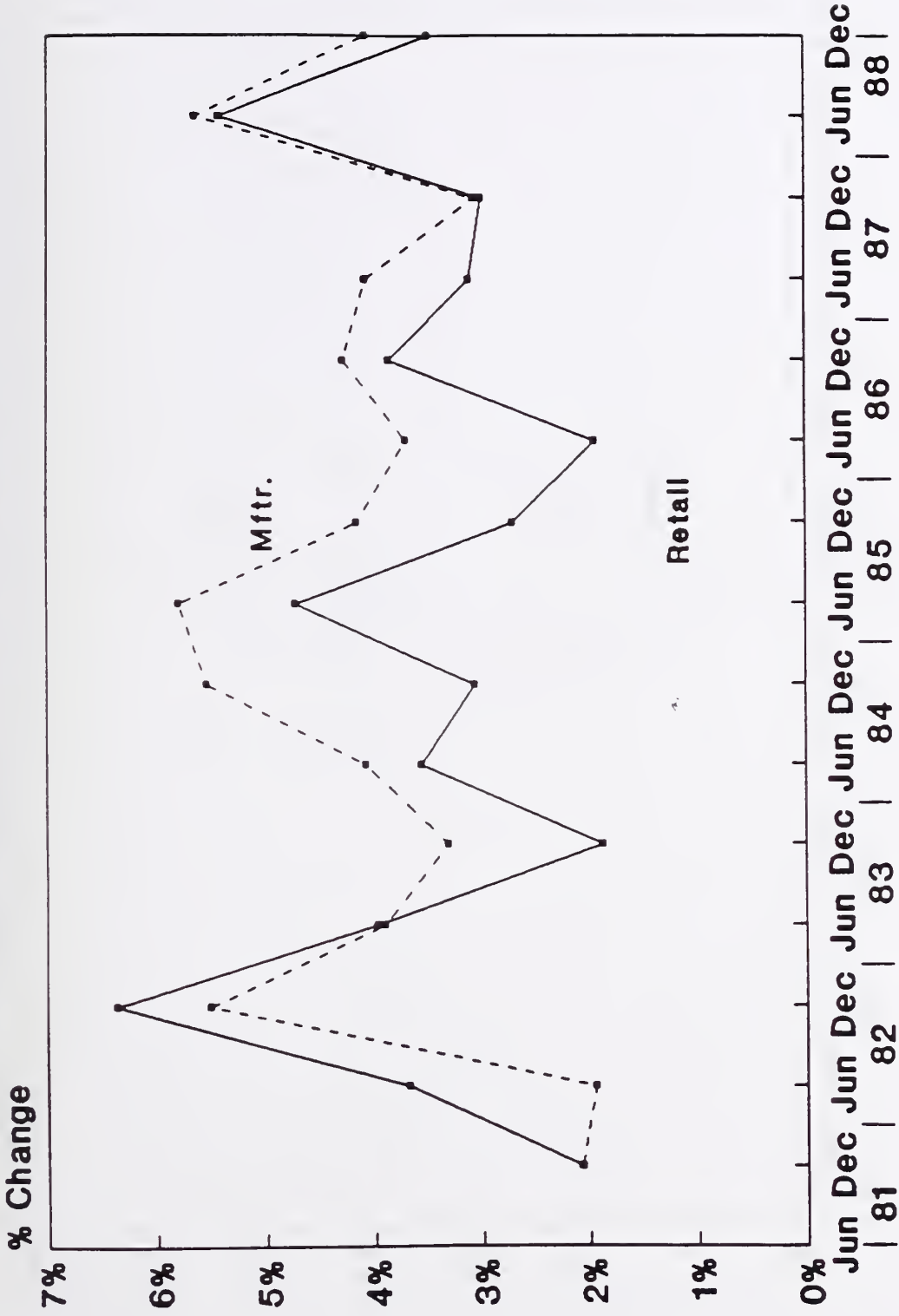
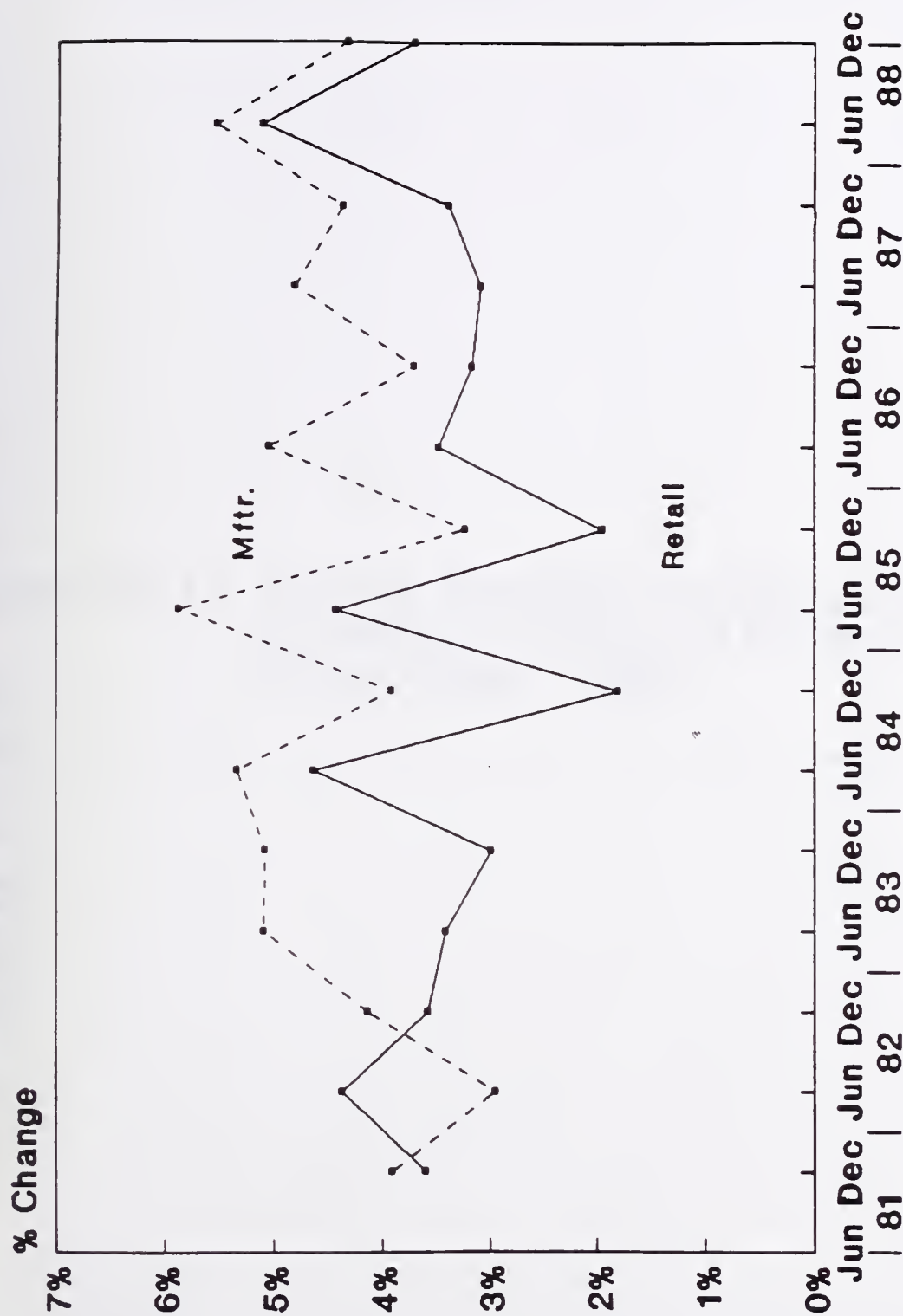


FIGURE C3: SEMI-ANNUAL CHANGE IN MANUFACTURER AND RETAIL MULTIPLE SOURCE DRUG PRICE INDICES



Appendix D: Simple Average Annual and Total
Change in individual Drug Entity
Prices 1982 - 1988

Table D1: Simple Average Annual and Total Change in Manufacturers Drug Prices for Individual Single Source Drug Entities 1982-1988¹

	AVERAGE ANNUAL % CHANGE	PERCENT CHANGE 12/81-12/88 ²	ANNUAL PERCENTAGE CHANGE						
			82	83	84	85	86	87	88
ACYCLOVIR	5.3	42.4	1.0	0.3	0.1	5.0	6.8	13.4	10.5
ALPRAZOLAM	12.6	128.1	11.8	16.6	20.1	14.6	2.9	9.4	13.1
ATEMOLOL	8.6	77.5	10.4	3.8	9.1	11.3	7.4	6.8	11.2
BROMOCRIPTINE	4.9	39.2	-1.1	3.1	1.1	0.8	6.8	8.5	15.3
CAPTOPRIL	5.3	43.2	-1.4	0.6	10.2	6.9	7.9	4.5	8.3
CEFACLOL	9.7	90.5	9.6	10.9	10.2	9.7	8.7	10.7	7.9
CIMETIDINE	10.7	103.2	7.9	5.9	16.8	11.0	17.5	6.3	9.5
CLONIDINE	12.1	121.5	9.8	14.6	9.9	10.6	8.0	10.9	21.0
DILTIAZEM	3.9	30.4	0.0	0.6	5.1	7.1	9.2	-0.1	5.6
DIPIVEFRINE	7.9	69.5	6.2	9.5	7.1	8.6	4.7	8.6	10.2
GEMFIBROZIL	9.9	91.8	1.1	17.8	14.2	9.0	10.9	14.9	1.6
LEVODOPA/CARBIDOPA	8.4	76.6	9.1	8.6	7.0	6.6	8.4	9.3	10.1
METOPROLOL	13.2	138.0	10.1	16.3	14.3	17.4	14.5	8.2	11.8
NAPROXEN	7.7	67.6	15.8	9.2	7.7	7.9	4.6	4.3	4.6
PINDOLOL	14.8	160.4	0.0	17.9	13.9	21.5	19.5	13.4	17.6
PIROXICAM	6.7	55.1	-4.0	6.8	8.2	17.6	0.1	8.0	9.9
PRazosin	10.4	100.0	11.3	10.0	10.7	9.2	8.1	13.9	9.8
PROBUCOL	11.0	107.3	16.3	7.1	6.4	7.6	11.7	14.8	13.3
SUCRALFATE	8.2	72.1	-0.3	10.6	9.1	8.6	11.4	4.1	13.7
SULINDAC	10.6	102.3	16.1	10.1	6.8	7.1	10.3	13.3	10.8
TAMOXIFEN	4.3	33.3	-4.5	5.4	2.8	9.6	3.6	3.2	9.8
TIMOLOL	5.9	49.5	6.0	5.3	6.0	4.3	5.4	6.8	7.3
TOLMETIN	11.0	106.0	16.3	21.3	9.5	1.5	9.7	11.9	7.1
TRIAZOLAM	11.0	103.9	0.0	13.2	23.2	18.2	3.8	10.9	7.5

¹ Only drug entities which had data for originator and non-originator products included in the drug price indices are presented, other multisource drug entities included in estimates of only originator or non-originator price changes are not presented.

² The column presents change in prices from the June through December period of 1981 to the June through December period of 1988.

Table D2: Simple Average Annual and Total Change in Retail Drug Prices for Individual Single Source Drug Entities 1982-1988

	AVERAGE ANNUAL % CHANGE	PERCENT CHANGE 12/81-12/88 ²	ANNUAL PERCENTAGE CHANGE						
			82	83	84	85	86	87	88
ACYCLOVIR	16.5	150.2	0.2	81.5	-0.6	2.7	8.3	6.2	17.2
ALPRAZOLAM	8.1	71.5	5.2	9.1	14.7	8.8	2.1	6.3	10.4
ATENOLOL	6.2	52.2	8.8	2.1	5.0	7.9	4.2	6.3	9.2
BROMOCRIPTINE	3.8	26.5	-0.3	-9.1	11.0	-0.2	6.8	4.7	13.5
CAPTOPRIL	4.6	37.3	5.0	-1.1	6.6	6.0	5.7	3.4	6.8
CEFACLOR	8.5	76.4	12.4	6.0	7.9	6.4	10.6	8.5	7.5
CIMETIDINE	8.5	75.5	5.9	0.7	12.8	8.7	16.1	5.7	9.6
CLOMIDINE	10.4	98.3	11.4	12.1	7.3	8.0	5.9	7.4	20.5
DILTIAZEM	3.3	24.9	0.0	3.9	1.7	5.7	7.0	-0.1	4.7
DIPIVEFRINE	6.8	57.9	7.4	5.9	6.2	5.5	5.5	4.2	12.7
GEMFIBROZIL	6.6	55.9	-1.0	11.4	10.4	7.1	6.2	10.7	1.6
LEVODOPA/CARBIDOPA	7.6	67.3	10.9	7.1	6.6	4.7	6.2	8.9	8.9
METOPROLOL	11.0	107.2	10.6	11.6	11.4	12.5	10.6	8.2	12.0
NAPROXEN	7.2	61.0	17.9	10.1	5.0	6.4	3.1	3.2	4.5
PINDOLOL	10.2	94.8	0.0	1.8	9.5	16.8	17.3	9.7	16.2
PIROXICAM	8.1	71.2	16.3	5.8	6.8	13.6	-1.5	6.9	8.8
PRAZOSIN	8.4	76.0	11.9	7.3	7.2	6.7	4.9	11.5	9.6
PROBUCOL	8.8	80.1	16.2	3.5	4.8	7.4	9.1	12.1	8.8
SUCRALFATE	7.5	65.3	6.1	7.4	6.1	6.9	9.9	4.2	11.8
SULINDAC	9.5	88.7	15.3	8.6	6.5	6.2	7.4	12.5	10.3
TAMOXIFEN	4.1	31.7	0.4	4.3	3.3	7.0	1.8	2.5	9.1
TIMOLOL	4.9	39.2	12.4	-1.9	4.4	1.6	4.6	4.0	8.8
TOLMETIN	9.4	86.7	18.8	12.5	7.6	1.8	7.8	10.8	6.8
TRIAZOLAM	5.6	45.0	0.0	4.3	13.1	9.6	1.0	5.7	5.2

¹ Only drug entities which had data for originator and non-originator products included in the drug price indices are presented, other multisource drug entities included in estimates of only originator or non-originator price changes are not presented.

² The column presents change in prices from the June through December period of 1981 to the June through December period of 1988.

Table D3: Simple Average Annual and Total Change in Manufacturers Drug Prices for Individual Multiple Source Drug Entities 1982-1988¹

	TYPE	AVERAGE ANNUAL % CHANGE	PERCENT CHANGE 12/81-12/88 ²	ANNUAL PERCENTAGE CHANGE						
				82	83	84	85	86	87	88
ACETAMINOPHEN/CODEINE	ALL	6.9	59.4	5.8	6.5	6.9	3.7	6.1	7.5	11.9
ACETAMINOPHEN/CODEINE	ORIG	7.9	69.9	3.2	1.5	7.1	0.9	12.8	18.5	11.1
ACETAMINOPHEN/CODEINE	NONORIG	2.5	26.0	2.4	2.4	4.9	4.9	-0.5	-1.4	5.0
ACETAMINOPHEN/HYDROCODONE	ALL	8.1	71.3	-4.7	6.3	12.3	11.0	8.4	11.7	11.6
ACETAMINOPHEN/HYDROCODONE	ORIG	7.0	60.7	3.1	10.4	8.5	3.7	6.6	7.6	9.4
ACETAMINOPHEN/HYDROCODONE	NONORIG	7.9	69.2	-5.4	4.1	13.9	12.2	7.8	11.0	11.7
ACETAMINOPHEN/OXYCODONE	ALL	12.6	129.3	17.8	23.2	13.2	8.5	4.3	12.1	8.8
ACETAMINOPHEN/OXYCODONE	ORIG	12.8	131.6	17.6	16.9	11.2	12.0	7.1	9.0	15.8
ACETAMINOPHEN/OXYCODONE	NONORIG	7.6	83.4	9.0	10.3	8.1	4.8	3.1	12.1	5.7
ACETAMINOPHEN/PROPOXYPHENE	ALL	11.0	110.2	10.9	16.7	9.6	16.1	5.6	8.3	10.1
ACETAMINOPHEN/PROPOXYPHENE	ORIG	13.2	137.1	15.3	20.9	11.3	18.3	8.9	9.1	8.8
ACETAMINOPHEN/PROPOXYPHENE	NONORIG	6.7	56.3	1.9	8.3	6.3	11.7	-1.0	6.7	12.8
ALLOPURINOL	ALL	0.7	4.1	-4.7	-1.4	4.6	9.0	-1.1	-2.3	0.5
ALLOPURINOL	ORIG	4.3	33.4	-1.7	-0.2	10.9	10.9	-1.1	4.3	7.2
ALLOPURINOL	NONORIG	-5.7	-35.2	-7.7	0.1	0.4	2.2	-3.4	-16.1	-15.6
AMITRIPTYLINE	ALL	0.8	13.1	-1.2	-4.0	-2.5	3.1	2.6	9.5	-1.9
AMITRIPTYLINE	ORIG	11.4	111.7	11.6	12.1	18.3	14.4	12.1	9.8	1.9
AMITRIPTYLINE	NONORIG	0.6	11.7	-1.9	-4.8	-2.9	2.9	2.9	9.7	-1.7
AMITRIPTYLINE/PERPHENAZINE	ALL	13.8	146.7	11.8	15.7	12.5	14.9	17.7	15.4	8.6
AMITRIPTYLINE/PERPHENAZINE	ORIG	14.3	153.7	12.0	16.7	12.6	15.0	19.1	16.4	8.1
AMITRIPTYLINE/PERPHENAZINE	NONORIG	11.9	120.0	11.0	13.0	13.0	14.9	9.7	10.4	11.6
BETAMETHASONE	ALL	11.9	109.6	8.4	16.1	13.5	7.8	24.0	5.3	8.0
BETAMETHASONE	ORIG	12.4	127.4	11.8	19.1	13.8	11.7	12.4	7.8	9.8
BETAMETHASONE	NONORIG	7.1	52.3	1.3	8.4	4.7	0.4	36.9	-2.5	0.2
CEFADROXIL	ALL	11.6	115.0	14.1	17.8	9.7	10.4	7.5	12.0	9.4
CEFADROXIL	ORIG	11.5	114.8	14.3	17.8	9.8	10.2	7.6	12.1	9.0
CEFADROXIL	NONORIG	11.9	118.8	10.1	18.0	10.3	11.1	8.8	12.5	12.4
CHLORTHALIDONE	ALL	4.0	32.5	8.7	2.4	9.0	0.0	0.8	5.1	2.3
CHLORTHALIDONE	ORIG	14.1	150.1	14.4	9.8	27.6	7.4	12.3	16.6	10.8
CHLORTHALIDONE	NONORIG	-9.4	-45.8	-4.1	-11.3	-6.5	-5.9	-12.9	-18.3	-6.7
DIGOXIN	ALL	17.8	252.4	11.4	11.5	33.0	27.9	23.9	9.2	7.4
DIGOXIN	ORIG	17.8	252.6	11.4	11.5	33.1	27.9	23.9	9.2	7.4
DIGOXIN	NONORIG	2.0	11.2	-0.9	10.3	3.6	18.9	-9.9	4.8	-12.4
DIPYRIDAMOLE	ALL	-6.4	-38.7	1.2	-14.5	-11.6	-8.2	-12.5	12.1	-11.2
DIPYRIDAMOLE	ORIG	5.6	44.8	2.0	4.0	7.1	5.6	3.2	2.6	14.7
DIPYRIDAMOLE	NONORIG	-8.6	-47.5	0.5	-9.0	-14.7	-12.2	-13.8	-10.8	-0.0
DOXYCYCLINE	ALL	2.3	26.1	26.6	5.6	-3.3	-1.1	-7.6	-2.8	-1.1
DOXYCYCLINE	ORIG	10.5	98.6	27.3	9.3	4.6	9.2	3.6	10.8	8.9
DOXYCYCLINE	NONORIG	-15.4	-71.4	8.5	3.9	-20.9	-13.7	-35.1	-14.1	-36.2
ERGOLOID	ALL	4.4	41.8	4.7	5.8	10.1	3.3	0.6	1.4	5.0
ERGOLOID	ORIG	11.5	114.3	6.1	8.1	13.4	11.2	14.9	11.0	16.0
ERGOLOID	NONORIG	-2.6	-6.4	2.0	-4.7	3.8	-1.0	-7.5	-5.1	-5.9
ERYTHROMYCIN	ALL	4.4	37.5	2.5	5.3	7.8	3.9	4.9	4.5	2.0
ERYTHROMYCIN	ORIG	7.0	61.4	3.5	15.0	9.5	2.7	7.9	4.9	5.7
ERYTHROMYCIN	NONORIG	3.7	31.8	2.7	2.9	7.2	4.3	3.7	4.5	0.8

THE HISTORY OF THE

REIGN OF

CHARLES THE FIRST

BY

JOHN BURNET

OF

THE UNIVERSITY OF OXFORD

IN TWO VOLUMES

LONDON

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Table D3: Simple Average Annual and Total Change in Manufacturers Drug Prices for Individual Multiple Source Drug Entities 1982-1988 (cont.)

	TYPE	AVERAGE ANNUAL % CHANGE	PERCENT CHANGE 12/81-12/88 ²	82	83	84	85	86	87	88
ESTROGENIC SUBSTANCE	ALL	15.0	166.0	9.0	21.5	11.7	15.4	20.7	15.0	11.7
ESTROGENIC SUBSTANCE	ORIG	16.0	181.0	9.1	22.7	13.4	16.7	23.8	15.7	10.7
ESTROGENIC SUBSTANCE	NONORIG	3.0	29.3	-0.3	-4.9	5.7	10.3	3.1	-0.3	7.5
FUROSEMIDE	ALL	-1.1	-7.1	-1.6	1.8	-2.1	-2.7	-3.8	-4.6	5.1
FUROSEMIDE	ORIG	0.9	6.2	-1.2	3.6	-0.0	-0.1	-1.9	-0.4	6.2
FUROSEMIDE	NONORIG	-18.2	-75.1	-9.1	-7.8	-23.8	-13.5	-19.6	-27.2	-26.4
HYDROCHLOROTHIAZIDE	ALL	-8.8	-47.2	-11.2	-20.1	-10.0	0.6	-1.3	-3.5	-16.3
HYDROCHLOROTHIAZIDE	ORIG	11.2	106.8	5.9	12.2	10.9	16.0	6.3	18.5	8.3
HYDROCHLOROTHIAZIDE	NONORIG	-14.5	-69.5	-31.8	-23.5	-13.1	-3.3	-8.8	-10.9	-10.0
IBUPROFEN	ALL	-3.3	-24.7	8.0	7.3	-23.9	-13.2	-2.6	2.0	-0.9
IBUPROFEN	ORIG	-3.3	-24.7	9.0	9.4	-24.0	-13.6	-3.4	1.0	-1.5
IBUPROFEN	NONORIG	-3.1	-22.4	-6.5	-2.0	-19.4	-9.0	0.2	5.3	9.3
INSULIN	ALL	8.1	54.7	5.8	16.2	-2.9	18.6	12.4	5.9	1.1
INSULIN	ORIG	9.7	63.2	10.7	11.0	-11.8	42.8	4.8	7.0	3.8
INSULIN	NONORIG	9.0	63.2	5.2	9.6	17.1	12.5	13.6	4.8	0.1
ISOSORBIDE DINITRATE	ALL	4.0	34.5	-0.2	-0.9	3.7	4.6	0.4	7.2	12.9
ISOSORBIDE DINITRATE	ORIG	8.2	73.5	9.4	10.0	5.8	7.8	5.5	16.0	3.2
ISOSORBIDE DINITRATE	NONORIG	2.0	16.7	-4.4	-5.6	3.1	3.2	-1.9	3.0	16.8
LEVOTHYROXINE	ALL	16.4	185.5	12.0	18.6	26.1	21.9	13.3	14.0	8.6
LEVOTHYROXINE	ORIG	17.6	208.3	12.6	15.6	28.8	18.4	15.4	18.1	13.9
LEVOTHYROXINE	NONORIG	14.0	128.5	19.5	22.7	15.4	32.1	11.2	-1.1	-1.8
METAPROTERENOL	ALL	13.9	146.6	13.3	25.5	8.3	9.2	10.8	12.4	17.7
METAPROTERENOL	ORIG	14.3	152.5	14.6	29.1	8.6	11.4	7.3	10.9	18.3
METAPROTERENOL	NONORIG	13.5	142.0	12.2	14.4	11.5	3.2	19.7	17.3	16.6
NORTRIPTYLINE	ALL	15.3	169.9	14.2	15.8	9.8	12.7	12.6	16.4	25.5
NORTRIPTYLINE	ORIG	13.3	135.4	11.7	13.9	7.3	8.3	7.3	13.4	31.1
NORTRIPTYLINE	NONORIG	16.8	195.8	16.2	17.2	11.7	15.9	16.6	18.7	21.3
PHENYTOIN	ALL	8.2	62.0	15.7	17.4	3.5	1.6	5.6	8.3	5.6
PHENYTOIN	ORIG	9.1	75.9	2.7	22.8	6.3	8.0	8.3	9.6	5.7
PHENYTOIN	NONORIG	5.0	6.1	67.5	-4.2	-7.7	-24.3	-5.0	3.2	5.4
PILOCARPINE	ALL	9.4	85.0	8.1	13.4	5.8	16.9	7.9	10.4	3.6
PILOCARPINE	ORIG	8.9	80.5	12.1	11.4	6.3	11.4	4.5	8.8	8.0
PILOCARPINE	NONORIG	9.5	86.1	7.1	13.9	5.6	18.1	8.7	10.7	2.6
PREDNISONE	ALL	0.3	1.3	2.8	0.7	1.8	5.2	-2.4	3.0	-9.3
PREDNISONE	ORIG	14.7	159.6	15.4	25.5	20.5	12.5	8.7	9.1	11.5
PREDNISONE	NONORIG	0.4	2.2	2.2	0.9	1.6	5.3	-1.9	3.4	-8.9
PROCAINAMIDE	ALL	7.1	65.1	10.0	11.0	4.7	9.5	1.3	4.8	8.2
PROCAINAMIDE	ORIG	11.3	112.1	17.5	16.8	8.1	13.0	3.4	8.2	12.2
PROCAINAMIDE	NONORIG	3.0	31.1	1.2	6.6	1.7	6.5	-1.5	3.2	3.2
SULFAMETHOXAZOLE/TRIMETHOPRIM	ALL	6.1	60.6	9.5	10.4	4.6	3.2	5.6	5.1	4.2
SULFAMETHOXAZOLE/TRIMETHOPRIM	ORIG	10.9	106.6	11.9	11.7	10.0	9.0	10.9	12.3	10.7
SULFAMETHOXAZOLE/TRIMETHOPRIM	NONORIG	-7.3	-42.7	-4.8	11.5	-13.5	-4.8	-9.1	-14.9	-15.6
TERBUTALINE	ALL	5.6	46.3	2.5	4.7	5.5	8.3	3.5	5.1	10.0
TERBUTALINE	ORIG	7.9	67.4	-3.7	10.0	7.9	10.1	5.7	11.8	13.4
TERBUTALINE	NONORIG	4.7	38.1	10.9	0.2	1.8	4.8	2.5	3.1	9.3

THE HISTORY OF THE UNITED STATES

OF THE UNITED STATES OF AMERICA

1776	1777	1778	1779	1780	1781	1782	1783	1784	1785
1786	1787	1788	1789	1790	1791	1792	1793	1794	1795
1796	1797	1798	1799	1800	1801	1802	1803	1804	1805
1806	1807	1808	1809	1810	1811	1812	1813	1814	1815
1816	1817	1818	1819	1820	1821	1822	1823	1824	1825
1826	1827	1828	1829	1830	1831	1832	1833	1834	1835
1836	1837	1838	1839	1840	1841	1842	1843	1844	1845
1846	1847	1848	1849	1850	1851	1852	1853	1854	1855
1856	1857	1858	1859	1860	1861	1862	1863	1864	1865
1866	1867	1868	1869	1870	1871	1872	1873	1874	1875
1876	1877	1878	1879	1880	1881	1882	1883	1884	1885
1886	1887	1888	1889	1890	1891	1892	1893	1894	1895
1896	1897	1898	1899	1900	1901	1902	1903	1904	1905
1906	1907	1908	1909	1910	1911	1912	1913	1914	1915
1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Table D3: Simple Average Annual and Total Change in Manufacturers Drug Prices for Individual Multiple Source Drug Entities 1982-1988 (cont.)

	TYPE	AVERAGE ANNUAL % CHANGE	PERCENT CHANGE 12/81-12/88 ²	ANNUAL PERCENTAGE CHANGE						
				82	83	84	85	86	87	88
TRIAMCINOLONE ACETONIDE	ALL	5.0	38.1	3.5	12.9	1.8	13.8	-0.4	-4.3	8.0
TRIAMCINOLONE ACETONIDE	ORIG	8.6	66.8	5.0	16.5	6.7	22.0	3.2	-1.7	8.7
TRIAMCINOLONE ACETONIDE	NONORIG	-0.9	-9.2	4.3	7.7	-6.9	-1.9	-3.7	-4.1	-1.6
WARFARIN	ALL	13.8	144.8	7.3	15.0	18.0	19.5	17.9	6.3	12.9
WARFARIN	ORIG	15.7	176.2	15.5	17.5	14.1	20.6	10.3	9.2	22.9
WARFARIN	NONORIG	14.7	154.6	0.6	11.6	19.8	21.3	33.6	13.6	2.4

¹Only drug entities which had data for originator and non-originator products included in the drug price indices are presented, other multisource drug entities included in estimates of only originator or non-originator price changes are not presented.

²The column presents change in prices from the June through December period of 1981 to the June through December period of 1988.

Table D4: Simple Average Annual and Total Change in Retail Drug Prices for Individual Multiple Source Drug Entities 1982-1988

	TYPE	AVERAGE ANNUAL % CHANGE	PERCENT CHANGE 12/81-12/88 ²	ANNUAL PERCENTAGE CHANGE						
				82	83	84	85	86	87	88
ACETAMINOPHEN/CODEINE	ALL	4.3	33.8	6.2	3.8	4.9	1.1	2.8	4.6	6.6
ACETAMINOPHEN/CODEINE	ORIG	5.7	46.7	4.5	3.1	5.0	-0.4	4.9	12.9	9.7
ACETAMINOPHEN/CODEINE	NONORIG	2.4	17.2	4.7	5.2	3.2	2.1	0.6	-1.1	2.3
ACETAMINOPHEN/HYDROCODONE	ALL	5.8	45.9	9.0	2.3	7.2	7.8	-3.2	7.7	9.9
ACETAMINOPHEN/HYDROCODONE	ORIG	5.2	42.7	8.3	4.5	5.4	4.9	3.2	3.4	6.9
ACETAMINOPHEN/HYDROCODONE	NONORIG	5.9	46.5	7.4	3.0	7.4	10.0	-4.2	7.3	10.2
ACETAMINOPHEN/OXYCODONE	ALL	10.0	94.3	14.1	17.2	10.2	6.7	7.1	6.3	8.4
ACETAMINOPHEN/OXYCODONE	ORIG	10.6	102.0	13.8	16.5	9.0	9.4	5.5	6.8	13.4
ACETAMINOPHEN/OXYCODONE	NONORIG	7.2	65.0	7.2	18.8	5.5	6.9	2.6	5.5	3.9
ACETAMINOPHEN/PROPOXYPHENE	ALL	8.7	80.1	13.4	8.5	7.4	11.8	7.0	5.9	6.8
ACETAMINOPHEN/PROPOXYPHENE	ORIG	10.2	96.8	16.6	13.5	7.6	12.9	7.0	6.6	7.3
ACETAMINOPHEN/PROPOXYPHENE	NONORIG	5.7	46.8	7.0	-1.5	7.1	9.7	7.1	4.6	5.9
ALLOPURINOL	ALL	1.5	10.7	1.2	-1.6	7.7	3.4	-1.5	0.4	0.9
ALLOPURINOL	ORIG	3.5	26.0	2.6	-0.8	11.7	4.9	-1.7	0.5	6.9
ALLOPURINOL	NONORIG	1.4	10.6	1.2	1.6	1.5	6.6	1.0	0.8	-2.6
AMITRIPTYLINE	ALL	1.9	11.2	3.8	-5.5	8.4	-6.2	8.9	2.5	1.5
AMITRIPTYLINE	ORIG	9.3	86.1	8.4	5.8	11.8	8.5	15.8	8.7	6.3
AMITRIPTYLINE	NONORIG	1.8	10.2	3.4	-6.0	8.2	-6.3	9.1	2.4	1.6
AMITRIPTYLINE/PERPHENAZINE	ALL	12.1	121.7	13.6	10.9	9.6	12.1	16.7	13.4	8.4
AMITRIPTYLINE/PERPHENAZINE	ORIG	12.4	126.4	12.7	12.2	9.7	12.0	17.7	14.3	8.4
AMITRIPTYLINE/PERPHENAZINE	NONORIG	10.5	101.0	17.9	7.1	9.6	12.2	10.9	7.7	8.4
BECLOMETHASONE	ALL	7.5	63.2	2.4	-1.2	7.6	9.9	13.4	1.4	18.8
BECLOMETHASONE	ORIG	7.5	63.2	2.4	-1.2	7.6	9.9	13.4	1.4	18.8
BETAMETHASONE	ALL	10.5	100.2	12.9	14.3	8.9	7.7	17.0	6.8	6.0
BETAMETHASONE	ORIG	12.1	121.7	17.2	15.5	10.9	9.0	13.3	9.7	8.7
BETAMETHASONE	NONORIG	6.0	46.2	1.2	7.4	4.6	5.6	19.9	1.5	1.5
CEFADROXIL	ALL	10.1	96.4	15.3	11.2	7.5	7.5	10.2	9.5	9.8
CEFADROXIL	ORIG	10.3	98.2	17.2	11.3	7.0	7.7	8.8	10.0	10.0
CEFADROXIL	NONORIG	9.6	88.8	6.2	10.1	9.2	6.7	15.4	8.3	11.4
CHLORTHALIDONE	ALL	4.3	33.6	8.8	2.2	11.0	0.5	4.2	1.0	2.0
CHLORTHALIDONE	ORIG	11.3	111.3	12.1	8.6	21.6	8.9	7.2	9.0	11.5
CHLORTHALIDONE	NONORIG	-0.7	-4.9	4.1	-5.0	1.7	0.1	-1.7	-3.2	-0.8
DIGOXIN	ALL	9.4	89.6	6.6	11.9	8.9	15.3	10.4	4.5	8.1
DIGOXIN	ORIG	9.4	89.6	6.6	11.9	8.9	15.3	10.4	4.5	8.1
DIGOXIN	NONORIG	14.4	99.7	6.9	94.7	3.0	-18.5	-4.2	4.6	14.0
DIPYRIDAMOLE	ALL	-3.3	-20.8	-1.3	-6.0	-4.9	-5.5	-5.2	-0.5	0.5
DIPYRIDAMOLE	ORIG	4.5	35.9	5.4	3.0	3.6	3.9	5.4	1.9	8.3
DIPYRIDAMOLE	NONORIG	-3.0	-19.9	8.3	-5.8	-0.8	-4.9	-8.5	-5.3	-3.7
DOXYCYCLINE	ALL	1.1	12.4	15.7	3.9	-5.2	-2.6	-5.0	-3.1	4.2
DOXYCYCLINE	ORIG	7.4	63.0	17.2	5.1	-0.2	5.0	3.8	6.6	14.4
DOXYCYCLINE	NONORIG	-7.4	-43.9	8.7	7.6	-15.1	-12.1	-17.4	-18.5	-5.3
ERGOLOID	ALL	4.7	41.8	7.3	3.9	5.1	2.1	2.3	5.5	6.9
ERGOLOID	ORIG	10.7	102.7	7.9	5.6	10.7	10.2	13.3	8.6	18.6
ERGOLOID	NONORIG	-0.0	2.9	6.7	-0.3	-0.9	-0.7	-3.5	-1.4	-0.2

Table D4: Simple Average Annual and Total Change in Retail Drug Prices or Individual Multiple Source Drug Entities 1982-1988 (cont.)

	TYPE	AVERAGE ANNUAL % CHANGE	PERCENT CHANGE 12/81-12/88 ²	ANNUAL PERCENTAGE CHANGE						
				82	83	84	85	86	87	88
ERYTHROMYCIN	ALL	4.0	30.3	4.8	-0.2	4.8	0.9	4.8	5.9	7.2
ERYTHROMYCIN	ORIG	6.8	47.9	7.6	4.4	8.0	-0.0	3.3	3.3	20.9
ERYTHROMYCIN	NONORIG	3.1	25.1	4.3	-0.8	3.2	2.1	5.1	6.8	1.0
ESTROGENIC SUBSTANCE	ALL	18.7	103.7	18.0	6.8	-0.2	49.6	25.2	-5.3	37.0
ESTROGENIC SUBSTANCE	ORIG	19.4	113.2	17.8	7.6	0.4	50.6	26.8	-4.0	36.9
ESTROGENIC SUBSTANCE	NONORIG	7.7	67.6	8.0	11.9	8.3	-0.5	14.4	5.2	6.4
FUROSEMIDE	ALL	1.9	13.4	-0.2	11.4	0.2	-4.5	1.3	1.7	3.0
FUROSEMIDE	ORIG	2.7	19.1	0.1	12.2	1.2	-3.4	1.4	2.5	4.9
FUROSEMIDE	NONORIG	-3.0	-19.3	-0.0	-0.9	-5.9	-7.3	2.0	-4.2	-4.5
HYDROCHLOROTHIAZIDE	ALL	-1.4	-9.4	-0.4	-5.2	-0.0	-2.2	0.3	-2.0	-0.1
HYDROCHLOROTHIAZIDE	ORIG	7.5	66.1	6.0	7.7	7.5	6.6	8.0	7.8	8.9
HYDROCHLOROTHIAZIDE	NONORIG	-1.0	-7.2	0.2	-5.9	1.9	-3.3	1.2	-1.4	0.2
IBUPROFEN	ALL	-1.5	-12.1	8.4	6.3	-17.1	-9.2	-0.1	0.9	0.5
IBUPROFEN	ORIG	-1.3	-11.2	9.0	7.8	-16.4	-9.8	-0.5	0.6	0.1
IBUPROFEN	NONORIG	-2.1	-15.4	1.6	3.5	-18.0	-1.4	-0.7	-2.6	3.0
INSULIN	ALL	4.9	46.4	13.2	-2.8	-0.6	2.6	2.9	9.4	9.3
INSULIN	ORIG	1.5	11.2	6.6	-14.1	0.7	2.7	4.7	5.0	5.2
INSULIN	NONORIG	10.2	83.7	12.0	37.3	-0.2	3.2	-1.0	8.7	11.4
ISOSORBIDE DINITRATE	ALL	5.0	41.4	9.4	1.5	3.4	4.2	4.2	7.2	5.3
ISOSORBIDE DINITRATE	ORIG	7.7	67.9	10.8	6.9	5.2	6.2	8.4	10.6	5.8
ISOSORBIDE DINITRATE	NONORIG	3.9	29.6	8.9	-0.7	2.7	3.4	2.4	5.6	4.9
LEVOTHYROXINE	ALL	12.5	126.3	12.9	12.9	18.7	12.7	10.1	10.0	10.3
LEVOTHYROXINE	ORIG	12.8	132.9	12.7	10.5	19.3	11.1	10.5	13.3	12.4
LEVOTHYROXINE	NONORIG	8.9	83.6	8.7	11.6	14.2	11.8	10.6	1.1	4.1
METAPROTERENOL	ALL	9.6	88.0	10.7	14.3	4.1	5.9	8.6	7.4	16.1
METAPROTERENOL	ORIG	9.9	92.0	12.8	12.4	4.3	6.9	9.9	6.4	16.5
METAPROTERENOL	NONORIG	9.5	87.2	8.3	15.4	7.7	2.9	6.6	10.8	14.7
NORTRIPTYLINE	ALL	12.9	132.0	16.2	9.2	8.1	9.7	14.5	10.7	22.0
NORTRIPTYLINE	ORIG	11.7	114.6	12.5	10.0	6.2	5.8	12.2	10.0	25.2
NORTRIPTYLINE	NONORIG	13.8	145.1	18.9	8.6	9.6	12.6	16.1	11.2	19.6
PHENYTOIN	ALL	11.8	61.7	23.9	19.6	1.0	-6.6	26.1	9.3	9.1
PHENYTOIN	ORIG	9.5	50.6	10.4	11.5	3.2	-2.9	24.1	3.9	16.0
PHENYTOIN	NONORIG	21.0	106.0	78.0	51.8	-8.0	-21.6	34.0	31.0	-18.5
PILOCARPINE	ALL	8.0	66.5	11.8	1.6	7.9	9.1	8.4	6.0	10.9
PILOCARPINE	ORIG	10.0	94.0	14.3	12.6	8.4	9.4	9.4	7.6	8.2
PILOCARPINE	NONORIG	7.5	60.2	11.2	-1.0	7.8	9.0	8.2	5.6	11.6
PREDNISONE	ALL	1.0	7.8	4.2	2.1	4.1	1.8	-1.2	-1.0	-2.6
PREDNISONE	ORIG	11.3	110.5	20.8	15.3	13.4	6.7	8.6	4.6	9.9
PREDNISONE	NONORIG	1.0	7.5	3.4	2.0	4.1	1.5	-0.8	-0.8	-2.5
PROCAINAMIDE	ALL	7.0	60.6	14.1	8.9	6.5	4.9	-0.6	6.1	8.9
PROCAINAMIDE	ORIG	10.0	93.3	21.0	12.8	8.2	9.6	-1.1	8.0	11.7
PROCAINAMIDE	NONORIG	4.7	39.6	7.1	2.6	6.0	2.6	5.6	5.0	4.4

Table D4: Simple Average Annual and Total Change in Retail Drug Prices
or Individual Multiple Source Drug Entities 1982-1988 (cont.)

	TYPE	AVERAGE ANNUAL % CHANGE	PERCENT CHANGE 12/81-12/88 ²	ANNUAL PERCENTAGE CHANGE						
				82	83	84	85	86	87	88
SULFAMETHOXAZOLE/TRIMETHOPRIM	ALL	4.9	41.7	11.8	2.9	4.2	3.0	5.6	2.6	4.4
SULFAMETHOXAZOLE/TRIMETHOPRIM	ORIG	7.6	66.7	11.5	4.1	6.5	6.4	8.4	7.3	9.1
SULFAMETHOXAZOLE/TRIMETHOPRIM	NONORIG	0.4	0.9	8.7	7.4	2.4	-3.9	-2.1	-5.0	-4.5
TERBUTALINE	ALL	9.0	65.1	0.9	35.2	6.3	2.2	-0.0	12.0	6.4
TERBUTALINE	ORIG	11.7	109.9	1.6	33.6	13.1	3.4	12.8	6.3	11.0
TERBUTALINE	NONORIG	4.8	33.6	14.8	3.3	0.7	-0.4	-5.0	14.7	5.4
TRIAMCINOLONE ACETONIDE	ALL	4.3	28.0	10.2	8.5	3.6	6.8	-3.6	0.6	3.8
TRIAMCINOLONE ACETONIDE	ORIG	7.5	51.3	10.7	15.3	8.2	11.6	-3.8	3.5	7.0
TRIAMCINOLONE ACETONIDE	NONORIG	2.7	13.1	14.5	-10.4	3.5	7.5	3.4	-10.1	10.7
WARFARIN	ALL	11.5	110.2	8.9	9.7	13.9	17.4	6.5	10.6	13.7
WARFARIN	ORIG	11.3	110.4	13.4	7.8	11.2	13.1	7.4	7.8	18.2
WARFARIN	NONORIG	11.6	94.8	32.0	1.3	10.0	18.4	2.6	11.7	5.4

¹Only drug entities which had data for originator and non-originator products included in the drug price indices are presented, other multisource drug entities included in estimates of only originator or non-originator price changes are not presented.

²The column presents change in prices from the June through December period of 1981 to the June through December period of 1988.

Appendix E: Data Sources

Appendix E

Data Sources

IMS America Ltd. provided information on retail purchases of the most frequently used prescription products by person 65 years of age and over during 1988. IMS utilized special programming support to create an extracted file of pertinent data elements from the National Disease & Therapeutic Index (NDTI), the U.S. Pharmaceutical Market--Drugstores (USD), and the National Prescription Audit (NPA).

NDTI--Begun in 1956, this database is a continuing compilation of statistical information about the patterns and treatment of disease encountered by physicians in office-based practice in the continental United States. The number of patient visits along with the number and types of drug therapy are measured in association with a variety of characteristics, such as patient age. The NDTI was used in this project to determine the most frequently used outpatient drug therapies by the Medicare population.

USD--The U. S. Drugstore audit is a monthly report on the volume, in terms of dollars and units, of both prescription and OTC pharmaceutical products purchased for resale by retail outlets in the continental United States. The estimates in this database are based upon information collected from drug wholesalers, independent and chain pharmacies, and discount houses or mass merchandiser. Excluded from this audit's universe of measurement are supermarket, department store, and mail order pharmacies. This database was used to measure the purchases of prescription products into pharmacies.

NPA--Since 1952, the NPA has measured the rate at which drugs move via formal prescriptions out of retail pharmacies to consumers in the continental United States. This database counts the number of new and refill prescriptions dispensed by pharmacists to patients. Included in this audit are total prescription quantities and costs or, price paid, at retail for the prescription. Information from this database was extracted to profile retail prescription activity.

MDDB--Master Drug Data Base (MDDB) has been maintained by Medi-Span, Inc. since 1978. The Medi-Span Master Drug Database was utilized to verify questionable data values and as an aid in identifying multiple source status of various drug products.

Multiple source drug products also were classified as originator and non-originator products so price trends for each category of products could be analyzed. Between 1981 and 1988 the retail and manufacturer price indices for originator multiple source drugs increased much greater than the corresponding indices for non-originator multiple source drugs.

Appendix F: Data File Procedures

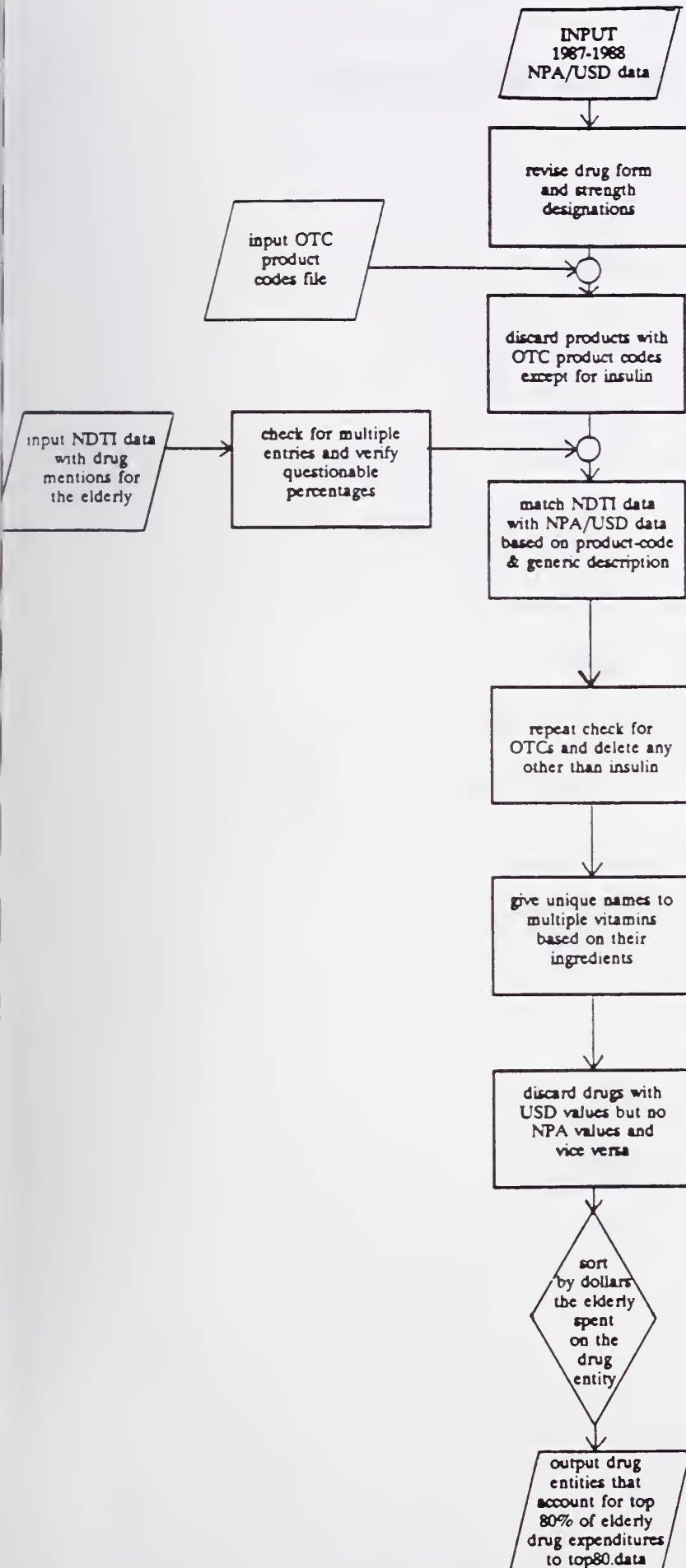
Appendix F

Data File Procedures

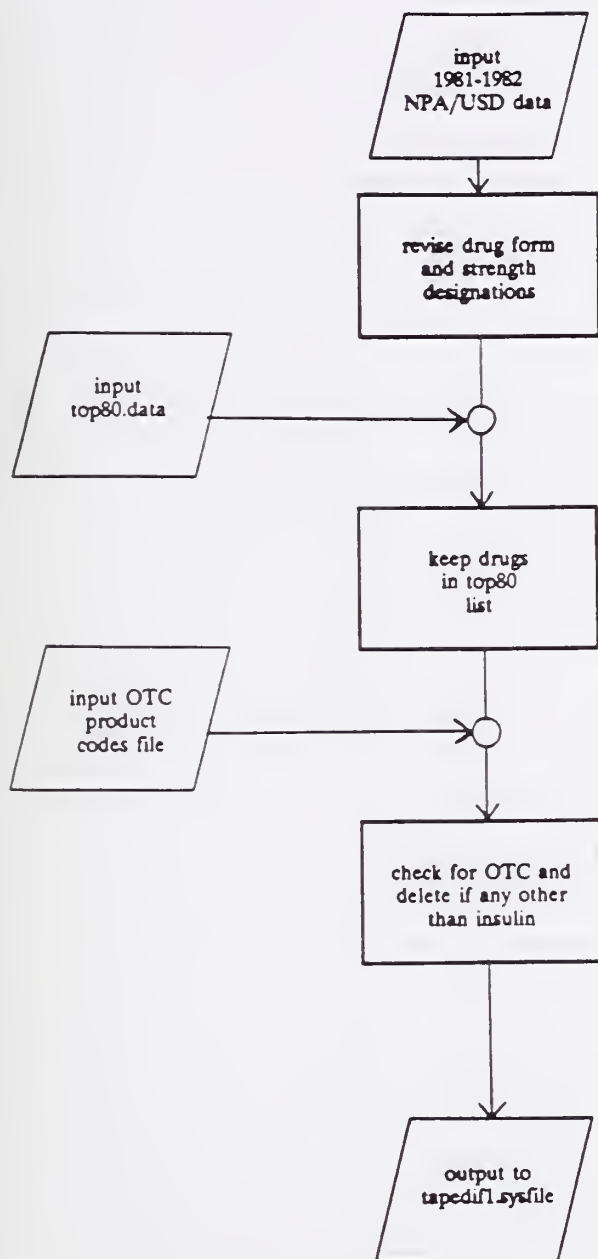
IMS America Ltd. produced custom extracted files of pertinent data elements from the National Disease & Therapeutic Index (NDTI), the U.S. Pharmaceutical Market--Drugstores (USD), and the National Prescription Audit (NPA) for use in the analysis presented in this report. This data was provided on four tapes, 1981-1982 NPA/USD data, 1983-1984 NPA/USD data, 1985-1986 NPA/USD data, and 1987-1988 NPA/USD data. These tapes contained estimates of dollar and unit sales of drug products at the retail and wholesale level from 1981 through 1988. The flow diagrams included in this appendix depict the processes used to identify the drugs accounting for 80 percent of retail prescription expenditures by the elderly and the creation of intermediate files used in the analyses.

IDENTIFICATION OF DRUGS ACCOUNTING FOR 80 PERCENT
OF ELDERLY'S DRUG EXPENDITURES IN 1988

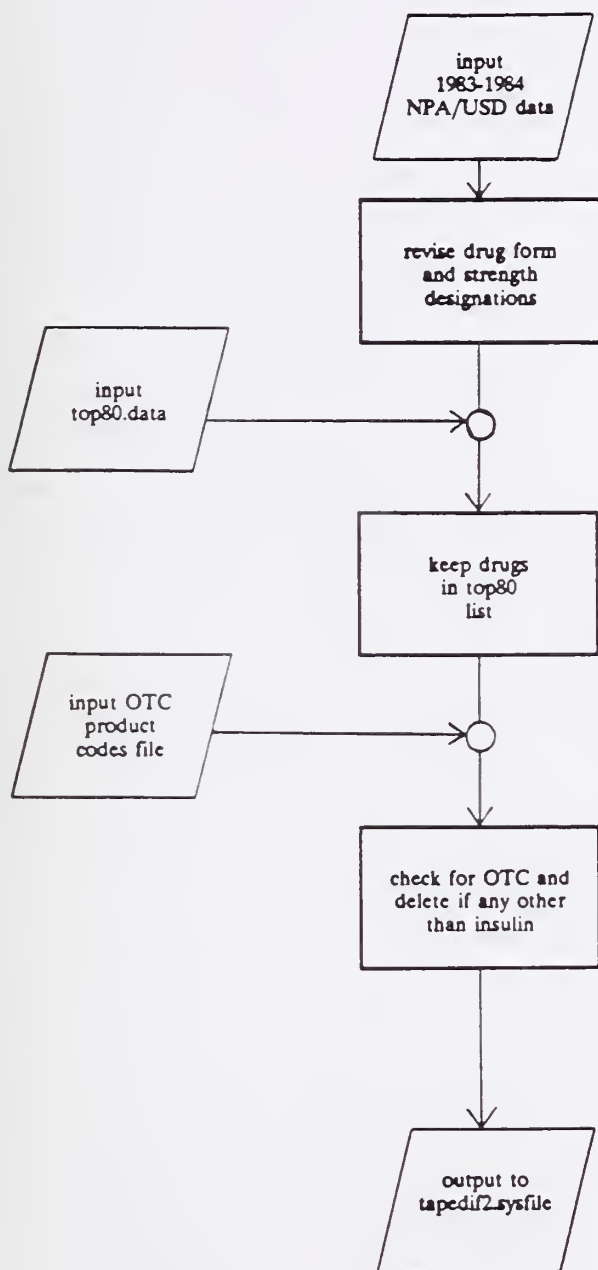
105



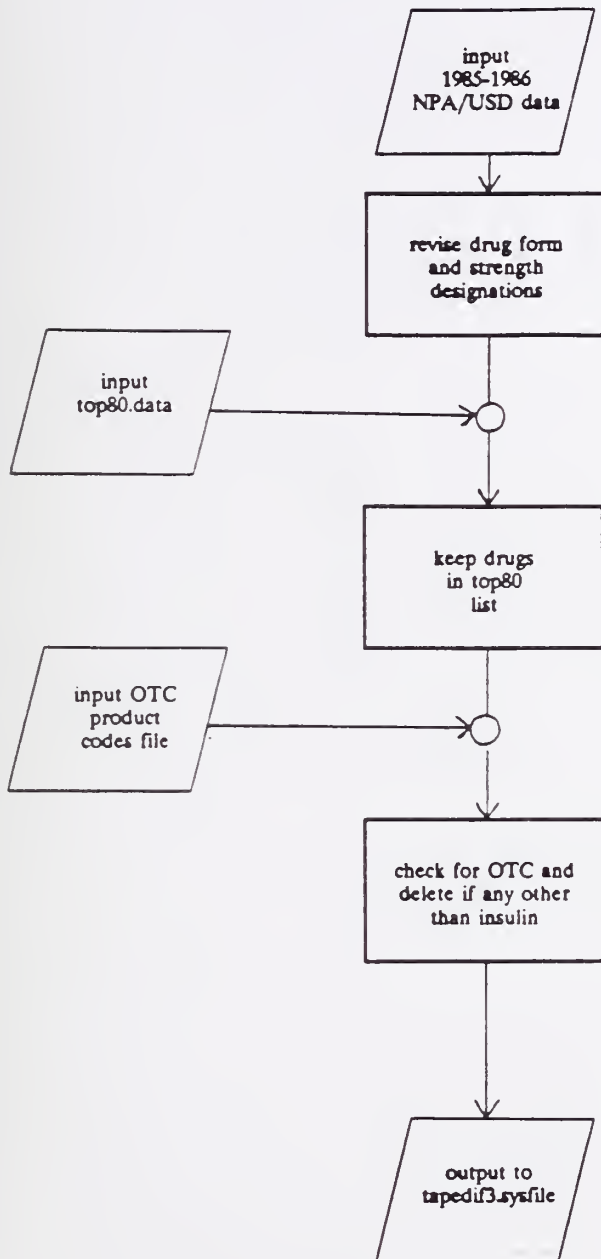
SELECTING RELEVANT DRUGS FROM 1981-1982 TAPE



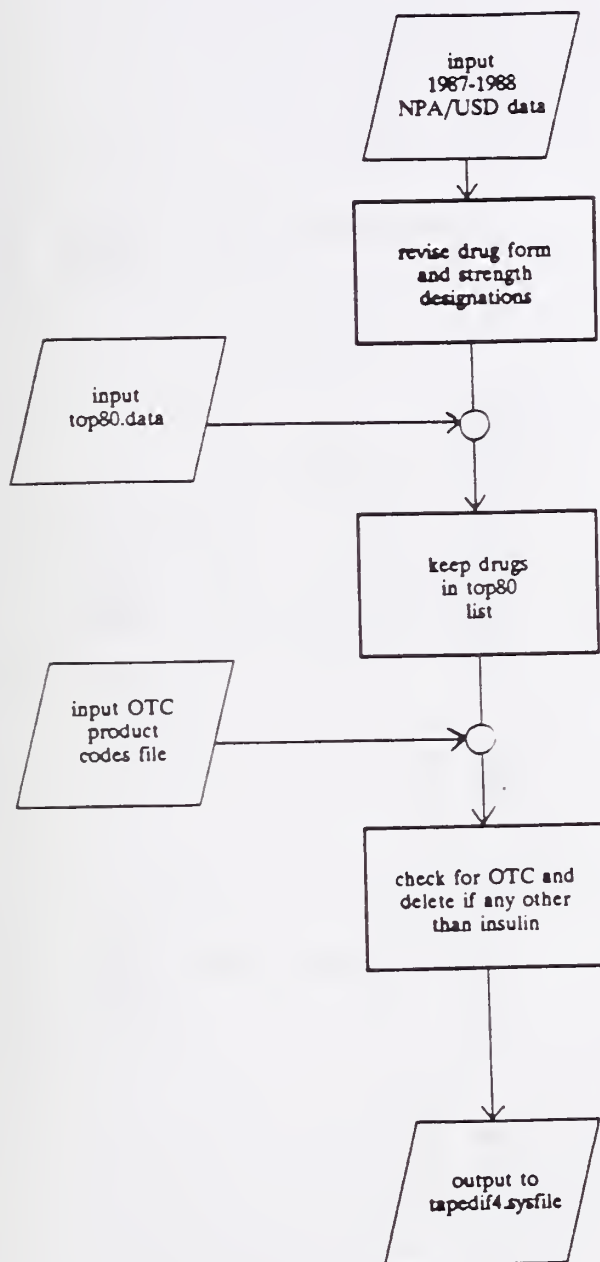
SELECTING RELEVANT DRUGS FROM 1983-1984 TAPE



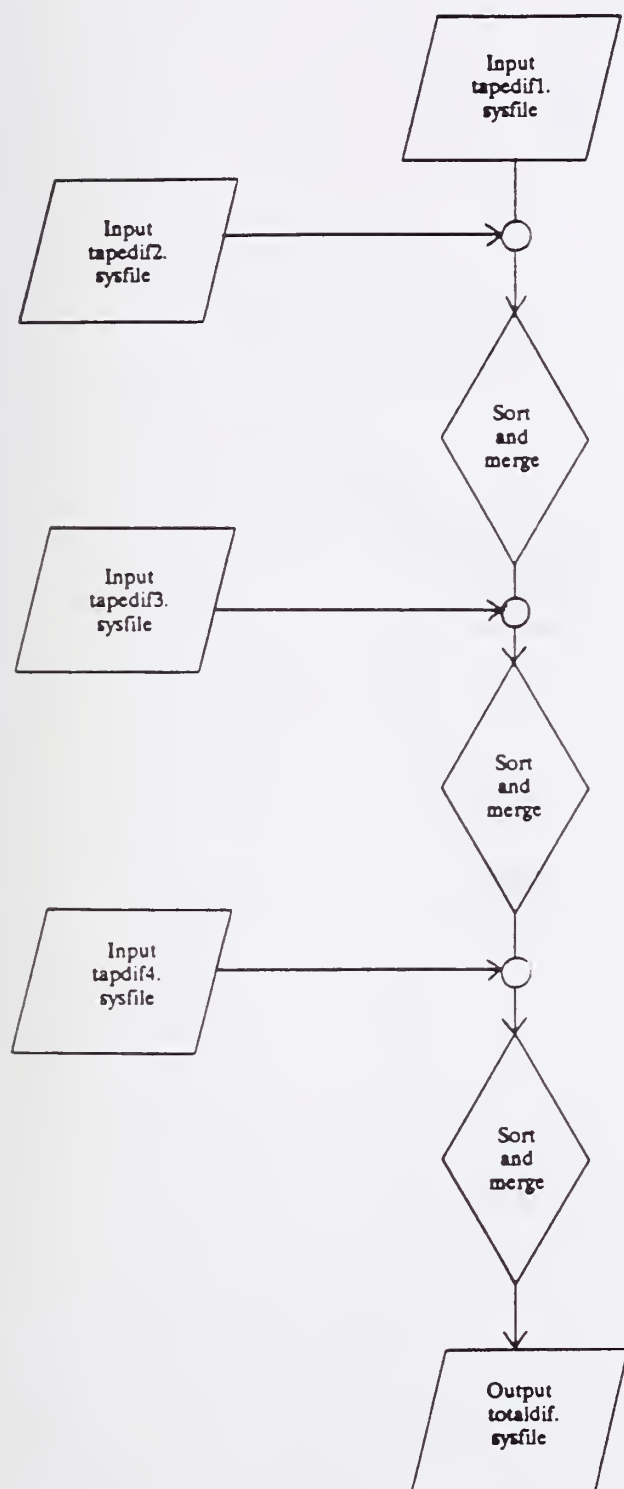
SELECTING RELEVANT DRUGS FROM 1985-1986 TAPE

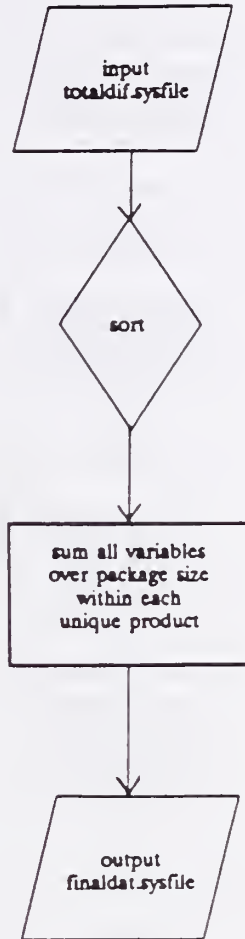


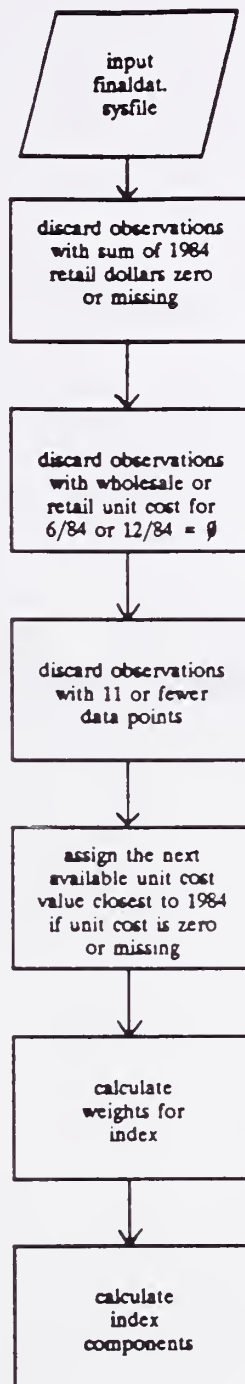
SELECTING RELEVANT DRUGS FROM 1987-1988 TAPE



MERGING 8 YEARS OF NPA/USD DATA FROM 4 TAPES



AGGREGATION OF DATA AT THE DRUG PRODUCT LEVEL



Appendix G: Formulas Used

Appendix G

Formulas Used

Data provided by IMS America, Ltd. was used to calculate many of the variables used in the analysis presented in this report. Appendix D describes the methods used to produce the intermediate files used in the analysis. This appendix presents the formulas used to calculate each of the variables used in the analyses.

FORMULA COMPONENT DEFINITIONS

MANUFACTURER UNIT PRICE: U.S. Drugstore estimate of the average cost paid by pharmacies per IMS extended unit of a drug.

NPA-TOT-EXT-UNIT-DISP: National Prescription Audit based estimate of total quantity of product dispensed in terms of extended units by retail pharmacies.

NPA-TOT-PRES-DISP: National Prescription Audit based estimate of total prescriptions dispensed by retail pharmacies.

NPA-TOT-RETAIL-DOL: National Prescription Audit based estimate of product dispensed in terms of retail or patient dollars by independent retail pharmacies.

RETAIL UNIT PRICE: National Prescription Audit based estimate of the average charge by pharmacies to patients per IMS extended unit of a drug.

USD-TOT-DOL-VOL: U.S. Drugstore estimates of purchases expressed in thousands of dollars.

USD-TOT-EXTEND-UNIT-VOL: U.S. Drugstore estimates of purchases expressed in thousands of equivalent units. (E.G.-# of tablets, # of mls.)

FORMULAS USED FOR CALCULATION OF ANALYSIS VARIABLES

1. Manufacturer Unit Price

$$= \frac{\text{USD-Tot-DoI-Vol}}{\text{USD-Tot-Ext-Unit-Vol}}$$

2. Retail Unit Price

$$= \frac{\text{NPA-Tot-Retail-DoI}}{\text{NPA-Tot-Ext-Unit-Disp}}$$

3. Pharmacy Margin Per Unit

$$= \frac{\sum_{\text{all products}} (\text{NPA-Tot-Retail-DoI} - (\text{NPA-Tot-Ext-Unit-Disp} * \text{manufacturers' unit price}))}{\sum_{\text{all products}} \text{NPA-Tot-Ext-Unit-Disp}}$$

4. Average Retail Prescription Price

$$= \frac{\sum_{\text{all products}} \text{NPA-Tot-Retail-DoI}}{\sum_{\text{all products}} \text{NPA-Tot-Pres-Disp}}$$

5. Average Retail Prescription Ingredient Cost

$$= \frac{\sum_{\text{all products}} (\text{NPA-Tot-Ext-Unit-Disp} * \text{manufacturers' unit price})}{\sum_{\text{all products}} \text{NPA-Tot-Pres-Disp}}$$

6. Pharmacy Margin Per Rx

$$= \frac{\sum_{\text{all products}} (\text{NPA-Tot-Retail-DoI} - (\text{NPA-Tot-Ext-Disp} * \text{manufacturers' unit price}))}{\sum_{\text{all products}} \text{NPA-Tot-Pres-Disp}}$$

7. Non-Originators' Dollar Multiple Source Market Share

$$= \frac{\sum_{\text{non-originator products}} \text{NPA-Tot-Retail-DoI}}{\sum_{\text{non-originator \& originator multiple source products}} \text{NPA-Tot-Retail-DoI}}$$

FORMULAS USED FOR CALCULATION OF ANALYSIS VARIABLES (cont.)

8. Non-Origiators' Unit Multiple Source Market Share

$$= \frac{\sum_{\text{non-origiator products}} \text{NPA-Tot-Ext-Unit-Disp}}{\sum_{\text{non-origiator \& origiator multiple source products}} \text{NPA-Tot-Ext-Unit-Disp}}$$

9. Non-Origiators' Dollar Total Market Share

$$= \frac{\sum_{\text{non-origiator products}} \text{NPA-Tot-Ext-Retail-Dol}}{\sum_{\text{all products}} \text{NPA-Tot-Ext-Retail-Dol}}$$

10. Non-Origiators' Unit Total Market Share

$$= \frac{\sum_{\text{non-origiator products}} \text{NPA-Tot-Ext-Unit-Disp}}{\sum_{\text{all products}} \text{NPA-Tot-Ext-Unit-Disp}}$$

11. All Drugs Manufacturer Price Index^{1,2,3}

$$= \left[\frac{\sum_{\text{all products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{all products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}} \right]$$

12. Single Source Manufacturer Price Index^{1,2,3}

$$= \left[\frac{\sum_{\text{all single source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{all single source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}} \right]$$

13. Multiple Source Manufacturer Price Index^{1,2,3}

$$= \left[\frac{\sum_{\text{all multiple source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{all multiple source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}} \right]$$

4. Originator Manufacturer Price Index^{1,2,3}

$$= \frac{\sum_{\text{originator multiple source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{originator multiple source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}$$

6. Non-Originator Manufacturer Price Index^{1,2,3}

$$= \frac{\sum_{\text{non-originator multiple source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{non-originator multiple source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}$$

5. Pre-1981 Multiple Source Manufacturer Price Index^{1,2,3}

$$= \frac{\sum_{\text{pre-1981 multiple source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{pre-1981 multiple source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}$$

7. Pre-1981 Originator Multiple Source Manufacturer Price Index^{1,2,3}

$$= \frac{\sum_{\text{pre-1981 originator mult. source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{pre-1981 originator mult. source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}$$

8. Pre-1981 Non-Originator Multiple Source Manufacturer Price Index^{1,2,3}

$$= \frac{\sum_{\text{pre-1981 non-originator mult. source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{pre-1981 non-originator mult. source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}$$

FORMULAS USED FOR CALCULATION OF ANALYSIS VARIABLES (cont.)

9. Post-1981 Multiple Source Manufacturer Price Index^{1,2,3}

$$= \frac{\sum_{\text{post-1981 multiple source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{post-1981 multiple source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}$$

10. Post-1981 Originator Multiple Source Manufacturer Price Index^{1,2,3}

$$= \frac{\sum_{\text{post-1981 originator mult. source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{post-1981 originator mult. source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}$$

11. Post-1981 Non-Originator Multiple Source Manufacturer Price Index^{1,2,3}

$$= \frac{\sum_{\text{post-1981 non-originator mult. source products}} \text{Manufacturer Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{post-1981 non-originator mult. source products}} \text{Manufacturer Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}$$

12. Retail Price Indices

The formulas used for calculation of the retail price indices were the same as the above except retail unit prices were used in place of manufacturer unit prices. The formula for the All Drugs Retail Price Index is shown below to illustrate the difference between the formulas used for calculating retail and manufacturer price indices.

All Drugs Retail Price Index^{1,2,3}

$$= \frac{\sum_{\text{all products}} \text{Retail Unit Price}_{it} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}{\sum_{\text{all products}} \text{Retail Unit Price}_{i1984} * \text{NPA-Tot-Ext-Unit-Disp}_{i1984}}$$

FORMULAS USED FOR CALCULATION OF ANALYSIS VARIABLES (cont.)

here:

- Manufacturer Unit Price_{it} is the manufacturer unit price for the *i*th product in period *t*.
- Manufacturer Unit Price_{i,1984} is the manufacturer price unit for the *i*th product in the 1984 base period.
- NPA-Tot-Ext-Unit-Disp_{i,1984} is the quantity i.e., number of extended units of the *i*th product dispensed in the 1984 base period.

As is general practice, every formula was multiplied by 100 so that the value of each index in the 1984 base year would be 100.

After calculation of index values, the values for each index were multiplied by a constant to convert the 1981 index to a value of 100 for ease in showing graphical trends from 1981 through 1988.

Appendix H: Comparison to CPI and PPI Analysis

Appendix H Comparison to CPI and PPI Analysis

A previous report (U.S. DHHS, 1989) analyzed and summarized prescription price change trends based on the Consumer Price Index (CPI) for prescription drugs and the Producer Price Index (PPI) for prescription drugs.

The CPI and PPI are price change indices, maintained by the Bureau of Labor Statistics, which track price changes of a "market basket" of prescription drugs over time. The retail and manufacturer price indices in this study are similar to the CPI and PPI, respectively, but include prescription product transactions for drug products which account for 80 percent of the retail expenditures by persons age 65 and over. Since the CPI and PPI were used in a previous Report to Congress and are commonly referred to as a means of tracking prescription price changes, these indices have been compared to the more comprehensive retail and manufacturer price indices developed in this report. One should note that the CPI and PPI indices reflect a different set of drugs than the indices in this report.

The Laspeyres retail prescription price index was compared with the CPI-All Items and the CPI-Rx Drugs for the 1981 to 1988 period. The average annual percent change for each of these indices is shown in Figure F1. The weighted retail index prepared for this analysis increased 62.6 percent between 1981 to 1988. During this same period the CPI for Rx drugs increased 85.5 percent, while the CPI for All Items increased 28.2 percent. A difference of more than 20 percentage points between the CPI for Rx drugs and the retail price index from this study was found over the period 1981 to 1988. Although a number of factors may have contributed to this difference, one major factor explaining this gap may have been the difference in types of prescription transactions included in these two indexes. The retail prescription price index from this study considered all types of prescription

transactions in retail pharmacies including cash transactions and third party transactions such as prescriptions covered by private insurance or medicaid programs.

The CPI for Rx drugs, in contrast, considered only those prescription transactions which were paid for directly by the end consumer. In other words, the prescriptions covered by public and private third party programs were not included in the set of prices evaluated by the CPI for Rx drugs. In 1989 41.5 percent of all retail prescriptions were paid directly by third party programs (i.e., Medicaid and private insurance).

The price paid by both private and public third party prescription programs is often less than the price paid by the general public for a specific prescription. Therefore, when the entire mix of cash and third party prescription transactions was considered (i.e., this study's retail prescription price index) it is not surprising to find that prices between 1981 and 1988 increased less than when only cash or private pay transactions were considered (i.e., CPI for Rx drugs).

The weighted manufacturer's price index was compared to the PPI for prescription pharmaceuticals for the 1981 to 1988 period (Figure F2). Although the PPI for prescription pharmaceuticals increased 89.6 percent, the weighted manufacturer index increased a total of 83.5 percent for the seven-year period. These two manufacturer price indices differed very little over the period 1981 to 1988 in comparison to the difference found in the consumer price indices. The type of manufacturer price transactions considered by this study's manufacturer price index and by the PPI for prescription pharmaceuticals did not differ substantially.

Both the retail and manufacturer weighted indices, based on the prescription drug products accounting for 80 percent of the retail prescription expenditures by persons age 65 and over, were found to have a

lower overall percent increase between 1981 and 1988 than either the CPI or PPI for prescription drugs.

The data and methods used for analysis of drug price changes in this report represent new approaches to analysis of drug price changes. The methodology has an advantage over the CPI and PPI in that it allows analysis of price trends at levels that can not be achieved with the CPI and PPI. Further exploration of drug price trends based on the methods presented in this report and analysis of the current methodology's strengths and weakness in comparison to the CPI and PPI is warranted. Such exploration could provide powerful tools that would produce the detailed pharmaceutical price trend data necessary for program expenditure forecasting and managing drug benefit program expenditures.

FIGURE H1: ANNUAL PERCENT CHANGE IN CPI-ALL ITEMS, CPI-Rx DRUGS, AND
WEIGHTED RETAIL PRESCRIPTION PRICE INDEX

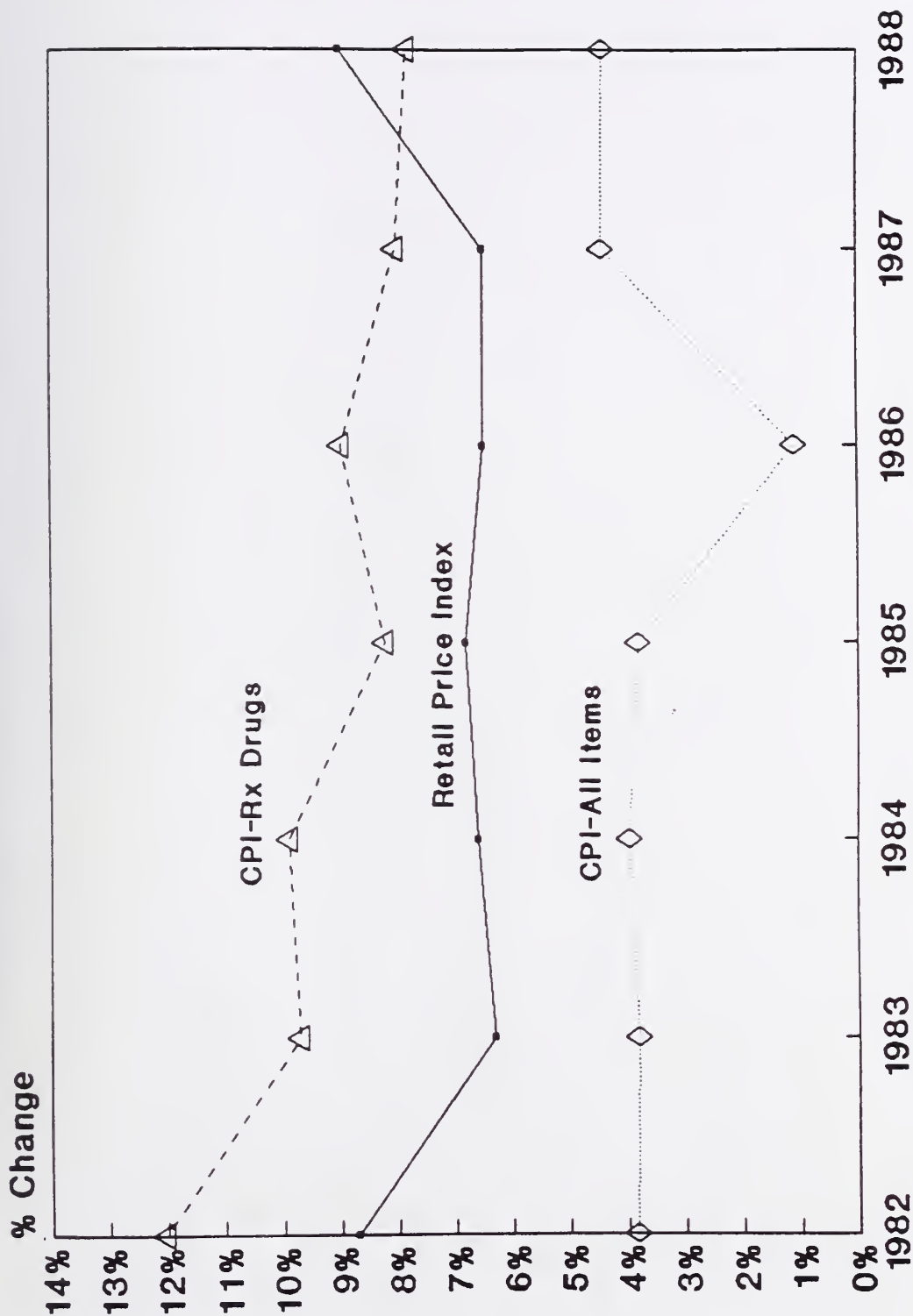
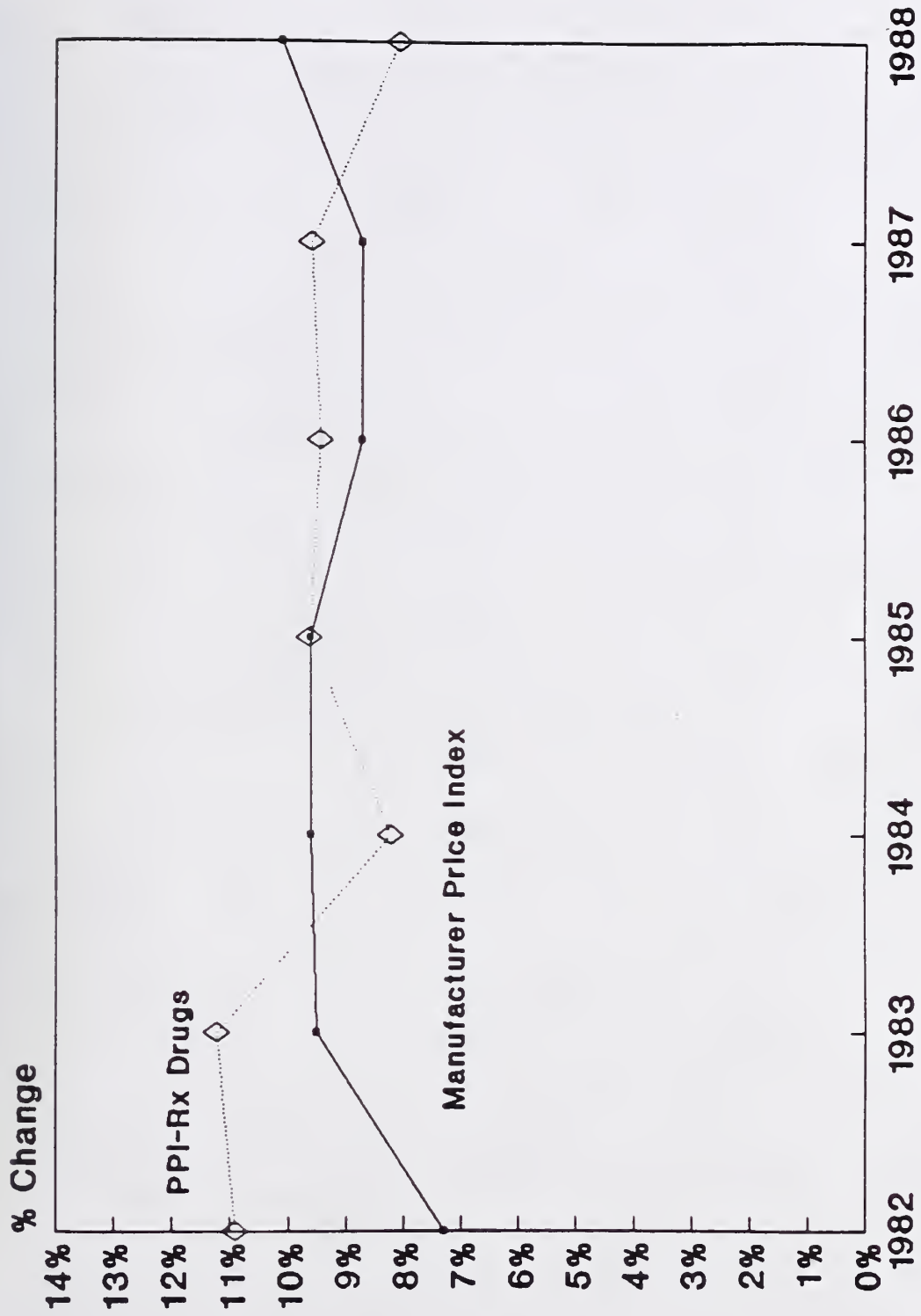


FIGURE H2: ANNUAL PERCENT CHANGE IN PPI-Rx DRUGS AND WEIGHTED
MANUFACTURER PRICE INDEX



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